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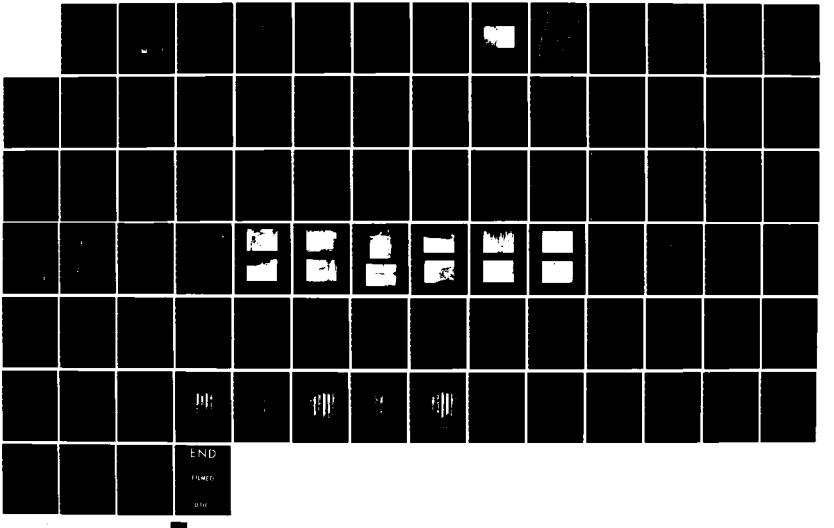

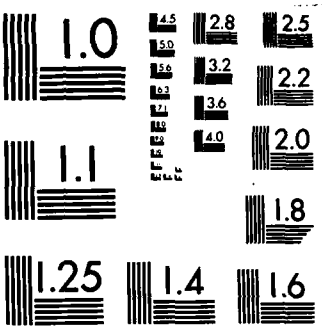

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CONNECTICUT RIVER BASIN

HARRISVILLE, NEW HAMPSHIRE

CHILDS BOG DAM
N H 00096

STATE NO 109.13

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Connecticut River Basin
Harrisville New Hampshire
Branch of Minnewawa Brook

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

THe dam has a hydrauli. height of 14.5 ft. and is 206 ft. long. The dam is in fair condition. Concerns are the inadequate spillway capacity, the inability to inspect stone faces of overflow spi-lway, and the rutting and disturbance of the valley bottom to the left of the discharge channel. It is intermediate in size wit with a significant hazard classification. A major breach with pool level at top of dam could result in the loss of 1-2 lives and cause appreciable damage to property.

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NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.:	NH00096
Name of Dam:	Childs Bog Dam
Town:	Harrisville
County and State:	Cheshire County, New Hampshire
Stream:	Branch of Minnewawa Brook
Date of Inspection:	April 30, 1979; June 18, 1979

BRIEF ASSESSMENT

Childs Bog Dam has a hydraulic height 14.5 feet, has a varied top-width with a minimum of 1 foot and totals 206 feet in length. It is a rockfill, concrete-capped, stone masonry dam with a nearly vertical downstream face and 1.5H:1V upstream face. The spillway is 157 feet long centered in the dam. The dam has a drain gate near the center of the spillway at the base of the structure. The dam spans a reach of a branch of Minnewawa Brook, and is located in southwest New Hampshire. Maximum storage capacity of the reservoir is 1280 acre-feet and normal surface area is 155 acres. The reservoir is 3/4 of a mile long and is used for recreational purposes. The dam contains runoff from a 1.4 square mile drainage area consisting of predominately wooded mountainous terrain.

The dam is in fair condition. Concerns are the inadequate spillway capacity, the inability to inspect stone faces of overflow spillway, and the rutting and disturbance of the valley bottom to the left of the discharge channel.

The dam is of intermediate size and significant hazard classification based on storage volume and possible loss of life in event of a breach. In accordance with Corps guidelines, the test flood ranges from ½ to the Probable Maximum Flood (PMF). Because of the potential for loss of life in event of a breach, the PMF was selected as the test flood. Using the PMF Guide curves for 'mountainous' terrain, the peak test flood inflow was determined to be 3,570 cfs (2550 csm). After routing through the reservoir, to determine the modifying effect of surcharge storage, the routed test flood outflow was determined to be 3,000 cfs (2143 csm) at elevation 1378.5' MSL. The test flood analysis indicates that the dam would be overtopped by 2 feet during the test flood (2.5 feet over spillway crest). The maximum spillway capacity before overtopping is 185 cfs which is only 6 percent of the routed test flood outflow. A major breach with pool level at top of dam could result in the loss of 0-2 lives and cause appreciable property damage.

The owner, New Hampshire Water Resources Board, should implement the results of the recommendations and remedial measures given in Sections 7.2 and 7.3 within one year after receipt of this Phase I Inspection Report.

Warren A. Guinan
Project Manager
N.H. P.E. No. 2339

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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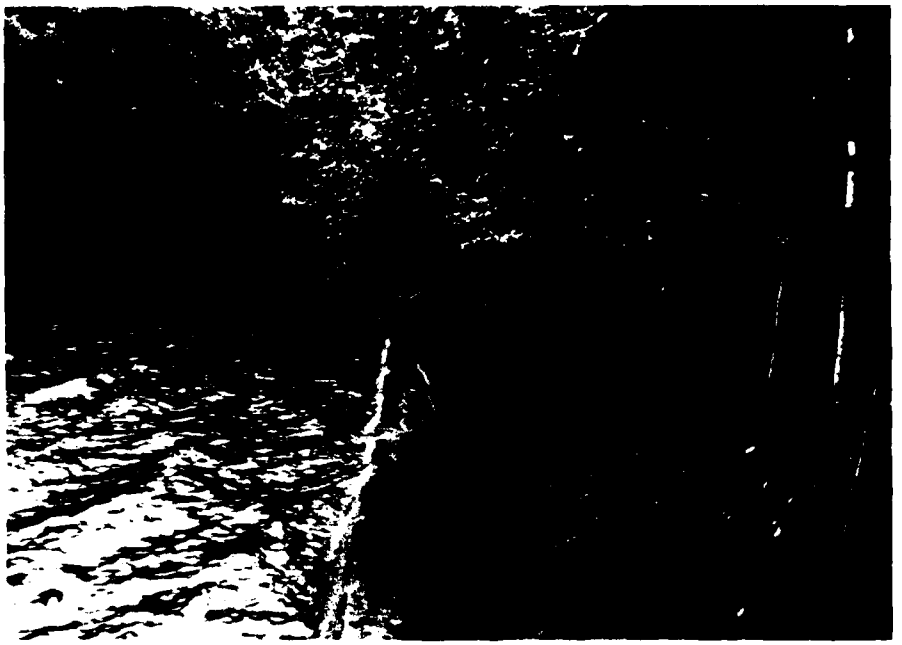
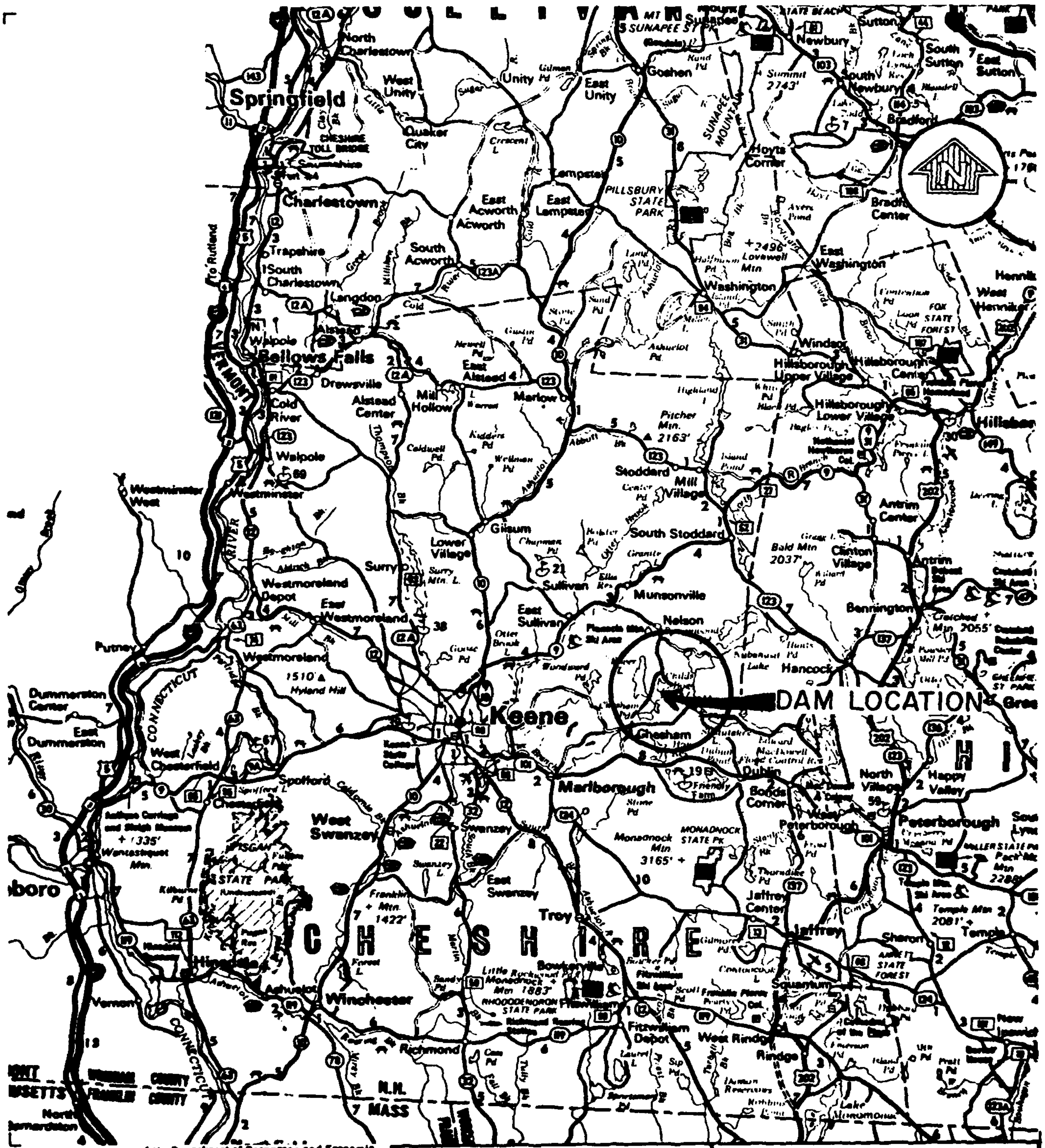


June 18, 1979

Figure 1 - View of Childs Bog Dam from the southwest abutment of the dam.



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SCALE IN MILES

0 5 10

MAP BASED ON STATE OF NEW HAMPSHIRE OFFICIAL HIGHWAY MAP.

Anderson-Nichols & Co., Inc. CONCORD NEW HAMPSHIRE	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

CHILDS BOG DAM
LOCATION MAP

TRIBUTARY TO SEAVER RESERVOIR NEW HAMPSHIRE

SCALE: SEE BAR SCALE

DATE: JULY 1979

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
CHILDS BOG DAM

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972 authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Anderson-Nichols & Company, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of New Hampshire. Authorization and notice to proceed were issued to Anderson-Nichols under a letter of November 20, 1978 from Max B. Scheider, Colonel, Corps of Engineers. Contract DACW33-79-C-0009 has been assigned by the Corps of Engineers for this work.

b. Purpose

(1) To perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) To encourage and prepare the States to initiate quickly effective dam safety programs for non-Federal dams.

(3) To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location. Childs Bog Dam is located in the Town of Harrisville, New Hampshire and is a rockfilled, concrete-capped stone masonry dam that spans an unnamed branch of Minnewawa Brook. After discharging over the dam, the branch flows south approximately 0.4 mile to its confluence with Seaver Reservoir, formed by a dam on Minnewawa Brook. The headwater of Minnewawa Brook is formed by Silver Lake Dam which is located about 0.3 mile upstream of Seaver Pond. Discharge from Seaver Reservoir continues as Minnewawa Brook and flows approximately 0.15 mile south to Chesham Pond. After discharging from Chesham Pond, Minnewawa Brook flows southwest approximately 7 miles to its confluence with Otter Brook to form the Branch. The Branch continues another 2.5 miles to Keene, New Hampshire where it joins the Ashuelot River. The Ashuelot River is a major tributary in the Connecticut River Basin. Childs Bog Dam is shown on U.S.G.S. Quadrangle, Monadnock, New Hampshire, with coordinates approximately at N42°57'08", W72°07'27", Cheshire County, New Hampshire. (See Location Map page vii.)

b. Description of Dam and Appurtenances. Childs Bog Dam is a rockfill concrete-capped, stone masonry dam. It has a hydraulic height of 14.5 feet, is 206 feet long, and has a varied topwidth with a minimum of 1 foot. The 157-foot long spillway is centered in the dam. A 2.5'H x 2.5'W inclined gate controls the 18-foot long low-level outlet that is located at the center of the spillway. The manual operating mechanism is located directly above the outlet on a concrete service platform approximately one-half foot higher than the spillway and 10 feet long. The crest of the spillway is 1.0 foot below the abutments of the dam. Therefore, the concrete service platform is defined as the top of dam.

c. Size Classification. Intermediate (hydraulic height - 14.5 feet; storage - 1280 acre-feet) based on storage ($\geq$ 1,000 to $<$ 50,000 acre-feet) as given in Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification. Significant hazard. A major breach with pool elevation at top of dam could result in the loss of 0-2 lives and cause appreciable property damage. (See Section 5.1 f.)

e. Ownership. Childs Bog Dam was built in 1924 for the Ashuelot Gas and Electric Company. An inspection report of June 13, 1930 from the files of the New Hampshire Water Resources Board (NHWRB) states that the owner then was the Public Service Company of New Hampshire. Ownership was transferred to the State of New Hampshire prior to 1968.

f. Operator. Mr. Vernon K. Knowlton, Chief Engineer, New Hampshire Water Resources Board, 37 Pleasant Street, Concord, New Hampshire 03301 is responsible for the operation of Childs Bog Dam. Phone: (603) 271-3406.

g. Purpose of Dam. The dam was constructed for storage purposes and is now used for recreation.

h. Design and Construction History. Childs Bog Dam was designed and constructed by L.H. Shattuck Co., Inc. Construction began in August 1924 and was completed in October 1924. In the NHWRB files, an information sheet dated January 1968 states that the dam was raised in 1926. No other mention of this or any other construction at the dam was found.

i. Normal Operating Procedures. The dam is visited on a weekly basis by a maintenance man of the NHWRB. A weekly log is kept regarding water levels and other conditions at the dam. The low-level gate is opened in the fall to draw down the level to provide storage for spring freshets.

1.3 Pertinent Data

a. Drainage Area. The drainage area consists of 1.4 square miles (896 acres) of mountainous terrain. The normal recreational

level has a surface area of 150 acres, which is equivalent to 17 percent of the watershed.

b. Discharge at Damsite

(1) Outlet works (conduits) - Drain gate 2.5'H x 2.5'W @ invert elevation 1362' MSL. Gate capacity at top of dam - 130 cfs @ 1376.5' MSL.

(2) The maximum discharge at the damsite is unknown.

(3) Ungated spillway capacity at top of dam - 185 cfs @ 1376.5' MSL

(4) Ungated spillway capacity at test flood elevation - 2050 cfs @ 1378.5' MSL

(5) Gated spillway capacity at top of dam - not applicable

(6) Gated spillway capacity at test flood elevation - not applicable

(7) Total spillway capacity at test flood elevation - 2050 cfs @ 1378.5' MSL

(8) Total project discharge at test flood elevation - 3000 cfs @ 1378.5' MSL

c. Elevation (ft above MSL; see (6) below)

(1) Streambed at centerline of dam - 1362 (at downstream toe)

(2) Maximum tailwater - unknown

(3) Upstream invert drain gate - 1362

(4) Recreation pool - 1376

(5) Full flood control pool - not applicable

(6) Spillway crest - 1376 (taken from disclosed plans and assumed to be spillway crest elevation)

(7) Design surcharge (original design) - unknown

(8) Top of dam - 1376.5 (concrete service platform)

(9) Test flood - 1378.5

d. Reservoir (feet)

(1) Length of maximum pool - 4120

(2) Length of pool at spillway crest - 3960

(3) Length of flood control pool - not applicable

e. Storage (acre-feet)

(1) Recreation pool - 1200

(2) Flood control pool - not applicable

(3) Spillway crest pool - 1200

(4) Top of dam - 1280

(5) Test flood pool - 1580

f. Reservoir Surface (acres)

(1) Recreation pool - 134

(2) Flood control pool - not applicable

(3) Spillway crest - 134

(4) Test flood pool - 154

(5) Top of dam - 138

g. Dam

(1) Type - rockfill concrete-capped, stone masonry dam with concrete apron

(2) Length - 206'

(3) Height - 15' (structural height)

(4) Topwidth - varied (minimum width - 1')

(5) Side slopes - upstream face - 1.5H:1V, downstream face - nearly vertical

(6) Zoning - not applicable

(7) Core - rockfill

(8) Cutoff - concrete

(9) Grout curtain - unknown

h. Diversion and Regulating Tunnel - not applicable (See j. below.)

i. Spillway

(1) Type - concrete-capped stone masonry

(2) Length of weir - 157'

PERIODIC INSPECTION CHECKLIST

PROJECT Childs Bog Reservoir Dam, NH DATE April 30, 1979 June 18, 1979

PROJECT FEATURE Spillway NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	Concrete-capped stone masonry weir
a. Approach Channel	
General Condition	Good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Not observable beneath reservoir surface
b. Weir and Training Walls	
General Condition of Concrete	Fair
Rust or Staining	None visible
Spalling	Limited to loss of surface laitance
Any Visible Reinforcing	None
Any Seepage or Effloresceence	None visible
Drain Holes	None visible
c. Discharge Channel	
General Condition	Fair
Loose Rock Overhanging Channel	Stone walls on either side of channel immediately downstream of dam
Trees Overhanging Channel	Trees overhanging
Floor of Channel	Boulders
Other Obstructions	Constriction in channel immediately downstream
Note:	1. Joints in concrete have some spalling. Black joint filler has also deteriorated some. 2. Gate operating mechanism appears in good condition.

PERIODIC INSPECTION CHECKLIST

PROJECT Childs Bog Reservoir Dam, NH DATE April 30, 1979 June 18, 1979

PROJECT FEATURE Outlet Structure NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	Fair
Rust or Staining	
Spalling	Several inches of the conduit appeared to have spalled away.
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain holes	None
Channel	
Loose Rock or Trees Overhanging Channel	Trees overhanging channel
Condition of Discharge Channel	Fair

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT Childs Bog Reservoir Dam, NH DATE November 30, 1978; April 30, 1979; & June 18, 1979

TIME 1400 (4/30/79)

WEATHER Warm, rainy (4/30/79)

W.S. ELEV. U.S. 1376 DN.S. 1364.3 (4/30/79)

PARTY:

1. Warren Guinan (10/30/78) (4/30/79)
2. Steve Gilman (10/30/78)
3. Ronald Hirschfeld (6/18/79)
4. Katherine Somerville (11/30/78; 6/18/79)
5. Pattu Kesavan (4/30/79)
6. Clair Plaud (6/18/79)
7.
8.
9.
10.

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Hydrology/Hydraulics	W. Guinan/K. Somerville	
2.	Structural Stability	S. Gilman	
3.	Soils & Geology	R. Hirschfeld	
4.			
5.			
6.			
7.			
8.			
9.			
10.			

APPENDIX A

VISUAL INSPECTION CHECKLIST

(5) Engage a Registered Professional Engineer to make a comprehensive technical inspection of the dam once every two years.

(6) Establish a surveillance program for use during and immediately after heavy rainfall and also a downstream warning program to follow in case of emergency conditions.

7.4 Alternatives

None.

SECTION 7
ASSESSMENT, RECOMMENDATIONS, AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. The visual examination indicates that Childs Bog Dam is in good condition. One minor concern with respect to the integrity of the dam is the rutting and disturbance of the valley bottom to the left of the discharge channel.

b. Adequacy of Information. The information available is such that the assessment of this dam must be based primarily on the results of the visual inspection. Because water was flowing over the dam at the time of the inspection, it was not possible to observe whether either leakage was occurring through the stone-masonry dam or gate, or seepage was discharging from the foundation at the toe of the dam.

c. Urgency. The recommendations made in 7.3 below should be implemented by the owner within one year after receipt of this Phase I report.

d. Need for Additional Investigation. Further study is needed of the hydrology and hydraulics with regard to the inadequate spillway capacity.

7.2 Recommendations

Engage a qualified registered professional engineer to inspect the dam when no water is flowing over the spillway to check on possible leakage and seepage. Also, inspect the stone masonry downstream face when no water is flowing over the spillway.

7.3 Remedial Measures

a. Operating and Maintenance Procedures. The owner should:

(1) Prevent trespassing in the valley bottom in the immediate vicinity downstream of the toe of the dam.

(2) Repair the rutted and disturbed valley bottom to the left of the discharge channel near the downstream toe. Once corrected, this problem area should continue to be monitored.

(3) Remove trees and their root systems from the banks of the discharge channel 25 feet on either side of the channel for a distance of 100 feet downstream from the dam or the limits of the state owned property whichever is less. Backfill properly.

(4) Continue to visually inspect the dam and appurtenant structures.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. The visual examination indicates the following evidence of potential problems:

(1) Rutting and disturbance of the valley bottom to the left of the discharge channel.

(2) Trees overhanging the discharge channel.

Because water was flowing over the dam at the time of the inspection, it was not possible to observe whether either water was leaking through the stone masonry dam itself or the gate, or seepage was discharging from the foundation or any combination of these effects.

b. Design and Construction Data. Two drawings dated August 1924 show the plan and cross section of the dam.

c. Operating Records. There are no operating records pertinent to the structural stability of the dam.

d. Post-Construction Changes. Available records indicate that the dam was raised in 1926, but no details are available.

e. Seismic Stability. This dam is located in Seismic Zone 2 and in accordance with the Phase I guidelines does not warrant seismic analysis.

A breach of Childs Bog Dam was analyzed from the dam through Seaver Reservoir and Chesham Pond to a point about 1 mile downstream of Chesham Pond Dam. The breach was assumed to occur with pool level at top of dam and develop to the toe of the dam. The time for a breach to develop with a bottom width of 85 feet and vertical sideslopes was determined to be 2.3 hours. A breach of this magnitude resulted in a discharge of 7,710 cfs. This breach discharge was routed downstream and resulted in the following stages and discharges:

At Seaver Reservoir Dam, the water surface would rise from top of dam elevation of 1204.3' MSL to 1207.2' MSL, overtopping the dam by 2.9 feet. The routed outflow from Seaver Reservoir of 7,180 cfs would continue downstream into Chesham Pond.

At Chesham Pond Dam the water surface would rise from top of dam elevation of 1156.4' MSL to 1161.1'MSL, overtopping the dam by 4.7 feet. A rise in Chesham Pond of 4.7 feet could cause property damage to six cottages located on its shoreline. Damage could possibly occur to the road crossing located immediately downstream of Chesham Pond Dam. The routed discharge of 5,834 cfs would continue downstream. One trailer located about 200 feet downstream of the dam, could be inundated by 2.8 feet of water, possibly causing damage to the structure and cause loss of 1 or 2 lives.

The road crossing, ½ mile downstream of the dam, could be overtopped by 4.6 feet with a breach discharge of 5,774 cfs. This amount of overtopping could cause damage to the culvert and the roadway. Two houses located just upstream of the road may be subjected to basement flooding and property damage. (See Appendix C - Figure 11.)

The next road crossing, one mile downstream of the dam, could be overtopped by 3 feet with a breach discharge of 5,517 cfs. This amount of overtopping could possibly damage the gravel roadway and culvert. (See Appendix C - Figure 12.) The reach between these two road crossings provides a large storage area for attenuation of the breach wave itself. (See Appendix C - Figure 13.) One house in this reach may be subjected to basement flooding.

A breach of Childs Bog Dam could result in the loss of 0-2 lives and appreciable property damage. Additional damage could possibly occur if the breach discharge caused overtopping failure of Seaver Reservoir or Chesham Pond Dams. Based on this analysis, Childs Bog Dam was classified Significant Hazard.

SECTION 5
HYDROLOGIC/HYDRAULIC

5.1 Evaluation of Features

a. General. Childs Bog Dam is a rockfill concrete-capped, stone masonry dam which impounds a reservoir of intermediate size. The dam contains runoff from a 1.4 square mile drainage area consisting of predominately wooded mountainous terrain. The total length of the dam is 206 feet of which 157 feet is spillway length. The spillway crest is 1 foot below the abutments of the dam. However, the concrete service platform, which is located in the center of the spillway and carries the operating mechanism for the low-level outlet, is only 0.5 higher than the spillway crest and therefore is defined as top of dam.

b. Design Data. No hydrologic or hydraulic design data was found.

c. Experience Data. No information regarding past hydrologic or hydraulic conditions at Childs Bog Dam was found.

d. Visual Observations. At the time of inspection, no evidence of damage caused by past overtopping was seen. Water flowing over the spillway crest made the determination of possible leakage or seepage difficult.

e. Test Flood Analysis. Childs Bog Dam is classified as being intermediate in size, having a hydraulic height of 14.5 feet and a maximum storage capacity of 1280 acre-feet; the dam was determined to have a Significant Hazard classification. Using the Recommended Guidelines for Safety Inspection of Dams, the test flood ranges from ½ to the Probable Maximum Flood (PMF). Because of the potential for loss of life in event of a breach, the PMF was selected as the test flood. Using the PMF guide curves for 'mountainous' terrain, the peak test flood inflow was determined to be 3,570 cfs (2550 csm). After routing through the reservoir, to determine the modifying effect of surcharge storage, the routed test flood outflow was determined to be 3,000 cfs (2143 csm) at elevation 1378.5'MSL. The test flood analysis indicated that the dam would be overtopped by 2 feet during the test flood (2.5 feet over spillway crest). The maximum spillway capacity before overtopping the top of dam is 185 cfs which is only 6 percent of the routed test flood outflow.

f. Dam Failure Analysis. The impact of failure of the dam with pool level at top of dam was assessed. Because of the tandem relationship of Childs Bog, Seaver Reservoir, and Chesham Pond Dams, all three dams were analyzed through the use of the Corps of Engineers HEC-1DB computer program. With this analysis, it could be determined how much overtopping would occur at each dam under various breach conditions. Since Childs Bog Dam is the most upstream dam, it can be determined what effect a breach of this dam would have on each lower dam and its impoundment.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures

Childs Bog Dam is owned and operated by the New Hampshire Water Resources Board (NHWRB). The lake level is maintained by the uncontrolled overflow spillway. In the fall, drawdown is accomplished by the opening of the low-level gate to provide spring freshet storage.

4.2 Maintenance of Dam

NHWRB is responsible for the maintenance of the dam.

4.3 Maintenance of Operating Facilities

Throughout the year, the dam is visited on a weekly basis by a maintenance man of the NHWRB. A weekly log is kept on conditions at the dam site. The gate operating mechanism appeared to be in good condition and properly maintained; however, the NHWRB would not permit the gate to be operated at the time of the inspection because of the difficulty of closing the gate when under a full head. Therefore, neither the gate condition nor its operation could be verified during the inspection.

4.4 Description of Any Warning System in Effect

No written warning system was revealed. However, during any emergencies William P. House, Forester, Forest Management Services, Chesham, New Hampshire, may be contacted.

4.5 Evaluation

The operation and maintenance procedures for Childs Bog Dam, consisting of a weekly program of inspection, should ensure that all minor problems encountered can be remedied within a reasonable period of time.

spillway. The gate operating mechanism itself appears to be in good condition. However, the New Hampshire Water Resources Board (NHWRB) would not permit the gate to be operated at the time of inspection. Therefore, the condition of the gate nor its operation could be verified.

The downstream end of the low-level conduit was observed to be in a deteriorated condition. Several inches of the end of the conduit appeared to have spalled away. (See Appendix C - Figure 7.)

d. Reservoir Area. The watershed above the reservoir is mountainous and heavily wooded. (See Appendix C - Figure 8.) No camps or other structures were noted on the shores of the reservoir. Sedimentation in the reservoir appears to be insignificant.

e. Downstream Channel. Immediately downstream of the dam the valley bottom is covered with soil and boulders. The water flowing over the crest of the spillway is concentrated into a narrow channel within a distance of about 30 feet downstream of the dam. (See Appendix C - Figure 9.) For a length of about 10 feet this channel is confined between two dry masonry retaining walls about 5 feet high and 3 feet apart. A number of trees overhang the channel downstream from this section. (See Appendix C - Figure 10.)

3.2 Evaluation

Based on the visual inspection, Childs Bog Dam is considered to be in good condition.

Because water was flowing over the spillway at the time of the inspection it was not possible to observe whether either leakage was occurring through the dam, gate or outlet conduit or seepage was discharging from the foundation near the downstream toe or any combination of these conditions. The dam should be inspected again when no water is flowing over the spillway to check on possible leakage and seepage.

The valley bottom to the left of the discharge channel has been disturbed and rutted, apparently the result of a vehicle having been stuck there. The source of the water causing this condition may be surface runoff from above the reservoir or it possibly may be, at least in part, seepage from the reservoir. The nearness to the downstream toe of the dam is a cause for concern.

Trees overhanging the discharge channel may blow over into the channel or drop over into the channel as a result of erosion during periods of large discharges from the reservoir. These trees could cause temporary damming of the channel.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. Childs Bog Dam is a low dam which impounds a reservoir of intermediate size. The watershed above and below the reservoir is mountainous and heavily wooded.

b. Dam. Childs Bog Dam is a rockfill dam with a nearly vertical stone masonry downstream face and a 1.5H:1V upstream face. (See Appendix C - Figures 2,3, and 4.) The hydraulic height of the dam is 14.5 feet; the dam totals 206 feet in length and has a variable topwidth with a minimum of 1 foot at the spillway crest. The crest and upstream face, which has a slope of approximately 1.5H:1V, are faced with concrete. The visible portion of the concrete cap on the stone masonry appeared to be in good condition. Erosion of the concrete is limited to the loss of surface laitance and the exposure of some coarse aggregate. The asphalt joint filler placed in the construction joints has weathered and eroded away in several of the visible joints. The downstream face is a dry masonry wall which has a batter of approximately 1H:12V. The downstream face appears to be in good condition. The ground surface at the two abutments is soil. The general depth to bedrock at the dam site was indeterminable.

At the time of the inspection, water was flowing over the spillway and consequently it was not possible to observe whether water was leaking through the dam itself or seeping through the foundation. No seepage was observed in the vicinity of the abutments.

On the left side of the valley bottom downstream of the dam, above the channel and below the crest of the dam, there is a small area in which the ground surface was badly rutted and disturbed, apparently the results of a vehicle having been stuck there. The ground surface in this area was wet and soft, but no seepage was discharging from it at the time of the inspection. (See Appendix C - Figure 5.)

c. Appurtenant Structures. Near the center of the spillway is a small concrete platform that supports the gate operating mechanism. (See Appendix C - Figure 6.) The concrete appears to be in good condition. Although some loss of surface laitance has occurred, it has been due to weathering. The construction photographs taken in 1924 indicate the platform was constructed at the same time as the concrete-capped stone masonry spillway. This platform has no access walkway to the gate operating mechanism. Access to the gate operating mechanism is gained from either walking across the spillway or by ladder from the downstream face of the

SECTION 2
ENGINEERING DATA

2.1 Design

Two design plans were disclosed dated August 1924 and drawn by L. H. Shattuck, Inc., Engineers, Manchester, New Hampshire. These plans are entitled "Plan and Sections" and "Sections". The design of Childs Bog Dam was done under ownership by the Ashuelot Gas and Electric Company.

2.2 Construction Records

A construction diary recorded by L. H. Shattuck, Inc. dated August 16, 1924 to November 24, 1924 was found.

2.3 Operation

No engineering operational data were found.

2.4 Evaluation

a. Availability. A search of the files of the New Hampshire Water Resources Board (NHWRB) revealed useful information for the purposes of this report.

b. Adequacy. The information obtained from the files of the NHWRB was used in conjunction with the visual inspection and the hydrologic and hydraulic computations to make the final assessments and recommendations of this investigation.

c. Validity. The structure as seen on the visual inspection is in close conformity to the disclosed design plans.

(3) Crest elevation - 1376' MSL

(4) Gates - none

(5) U/S Channel - The upstream channel is a branch of Minnewawa Brook and flows south from the headland into Childs Bog Reservoir; the brook is steep and narrow. The approach channel to the spillway is the open reservoir.

(6) D/S Channel - The water discharging over the spillway flows south 0.4 mile to Seaver Reservoir. It flows between two vertical stone masonry walls at a point approximately 30 feet downstream of the dam where a jeep trail crosses the brook. Discharge from Seaver Reservoir, Minnewawa Brook, flows approximately 0.15 miles south to Chesham Pond.

j. Regulating Outlets. An inclined 2.5'H x 2.5'W drain gate at invert 1362' MSL is located in the center of the spillway. A 4.5'W x 6.5'H trashrack is indicated at this location on the plans. The gates are controlled by a mechanism located directly above the outlet on a concrete platform. Access to the mechanism is possible by walking out on the spillway or by ladder from the downstream toe. However, the mechanism is essentially inaccessible when water is flowing over the spillway. The conduit is 18 feet long.

November 30, 1978;

PROJECT Childs Bog Reservoir Dam DATE June 18, 1979

PROJECT FEATURE Reservoir NAME K. Somerville

AREA EVALUATED	REMARKS
Stability of Shoreline	Good
Sedimentation	Not visible
Changes in Watershed Runoff Potential	None
Upstream Hazards	None
Downstream Hazards	Jeep trail; Seaver and Chesham Ponds downstream.
Alert Facilities	None posted
Hydrometeorological Gages	None
Operational & Maintenance Regulations	None posted

APPENDIX B

ENGINEERING DATA

Seaver's Reservoir, Harrisville, N.H.:

Drainage Area:	4.2 sq. miles (or about 2690 acres)
Pond Area:	42 acres
Shore line:	0.9 miles
Elevation:	1195 feet above Mean Sea Level

Like Chesham Pond, little recreational development has taken place along this pond as it was drawn down after the spring runoff. However, the State plans to maintain a more uniform summer level which should provide excellent fishing, boating and swimming. Also, there has been transferred about 30 acres of frontage along the south side of the pond connecting the Reservoir to the town road. This land is a potential park site. This dam was built in 1924.

Child's Bog Reservoir, Harrisville, N.H.:

Drainage Area:	1.4 sq. miles (about 800 acres)
Pond Area:	105.4 Acres
Shore Line	2.1 miles
Elevation:	1375 feet above Mean Sea Level

Little development recreationally exists at Child's Bog Reservoir due to wide summer level fluctuation. With State operation, a nearly uniform level will be maintained for recreational use. This dam was raised in 1926.

Conveyed with this dam are three parcels of land offering public access to the Reservoir. Two of these tracts border the reservoir offering good access to the pond for boats and swimming.

Howe Reservoir, Harrisville and Dublin, N.H.:

Drainage Area:	10.3 sq. miles (or about 6,600 acres)
Pond Area:	257.8 Acres
Shore Line:	5.5 miles
Elevation	1272 feet above Mean Sea Level

This reservoir has been drawn nearly dry in summers but will be maintained at a recreational level by the State. Both public and private development will result from a stable lake level. With its ready access from N.H. Route #101, good public access for boats will be afforded. There is little land except at the dam site transferred at this site.

Highland Lake, Stoddard and Washington, N.H.:

Drainage Area:	29.7 sq. miles (or about 19,000 acres)
Pond Area:	679.2 acres
Shore Line:	15.7 miles
Elevation:	1,296 feet above Mean Sea Level

NEW HAMPSHIRE WATER CONTROL COMMISSION
DATA ON DAMS IN NEW HAMPSHIRE

LOCATION STATE NO. 109-13

Town Harrisville : County Cheshire

Stream Childs Reservoir

~~Basin~~ Primary Contoocook R : Secondary Minnewawa Bk

Local Name

~~Coordinates~~—Lat. 42° 55' + 12800 : Long. 72° 5' + 10,800

GENERAL DATA

~~Drainage area~~: Controlled Sq. Mi.: Uncontrolled Sq. Mi.: Total 1.4 ~~Sq. Mi.~~

~~Overall length of dam~~ 180 ft.: Date of Construction

~~Height: Stream bed to highest elev.~~ 15.5 ft.: Max. Structure 14.5 ft.

Cost—Dam : Reservoir

DESCRIPTION Stone & Concrete Cap — Masonry Dam Ledge Foundation

Waste Gates

Type

Number : Size 2.5 ft. high x 3' ft. wide

Elevation Invert 74.5 : Total Area 15 sq. ft.

Hoist

Waste Gates Conduit

Number : Materials

Size ft.: Length ft.: Area sq. ft.

Embankment

Type

Height—Max. ft.: Min. ft.

Top—Width : Elev. ft.

Slopes—Upstream on: Downstream on

Length—Right of Spillway : Left of Spillway

Spillway

Materials of Construction Concrete

~~Length~~—Total 80' and 60' ft.: Net 140' ft.

~~Height of permanent section~~—Max. 14.5 ft.: Min. ft.

Flashboards—Type : Height ft.

Elevation—Permanent Crest : Top of Flashboard

~~Flood Capacity~~ 560 cfs.: 400 cfs/sq. mi.

Abutments

Materials: Concrete

Freeboard: Max. 1.0' ft.: Min. ft.

Headworks to Power Devel.—(See "Data on Power Development")

OWNER Public Service Co of N H

REMARKS Use Storage

Tabulation By A A N & R L T Date December 13, 1938

B&B21284

7206

NEW HAMPSHIRE WATER CONTROL COMMISSION
DATA ON RESERVOIRS & PONDS IN NEW HAMPSHIRE

LOCATION AT DAM NO. 109.13

Town Harrisville : County Cheshire

Stream Childs Reservoir

Basin—Primary Conn. R. : Secondary Minnewawa Bk

Local Name

DRAINAGE AREA

Controlled ..... Sq. Mi.: Uncontrolled ..... Sq. Mi.: Total 1.4 Sq. Mi.

ELEVATION vs. WATER SURFACE AREA vs. VOLUME

Point	Head Feet	Surface Area Acres	Volume Acre Ft.
(1) Max. Flood Height			
(2) Top of Flashboards			
(3) Permanent Crest			
(4) Normal Drawdown	14	120	1200
(5) Max. Drawdown			
(6) Original Pond	U.S.G.S. 1370.		

Base Used .....: Coef. to change to U.S.G.S. Base .....

RESERVOIR CAPACITY

	Total Volume	Useable Volume
Drawdown	ft.	ft.
Volume	ac. ft.	ac. ft.
Acre ft. per sq. mi.		
Inches per sq. mi.		

USE OF WATER Storage

OWNER Public Service Co. of N.H.

REMARKS

Tabulation By A.A.N.&R.L.T. Date December 12, 1938,

NEW HAMPSHIRE WATER RESOURCES BOARD

INVENTORY OF DAMS AND WATER POWER DEVELOPMENTS

DAM

BASIN Connecticut NO. 13 109.13

RIVER Childs Reservoir MILES FROM MOUTH D.A.SQ.MI 1.4

TOWN Harrisville OWNER ~~Ashuelot Gas + Elec. Co.~~ ~~Keene Gas + Elec. Co.~~ P.S.Co. of N.H.

LOCAL NAME OF DAM

BUILT DESCRIPTION ~~Earth~~ Stone concrete cap + abutments

POND AREA-ACRES 120 DRAWDOWN FT. 14 POND CAPACITY-ACRE FT. 1200

HEIGHT-TOP TO BED OF STREAM-FT. ~~20~~ 15.5 MAX. MIN.

OVERALL LENGTH OF DAM-FT. ~~180~~ 180 MAX.FLOOD HEIGHT ABOVE CREST-FT.

PERMANENT CREST ELEV.U.S.G.S. LOCAL GAGE

TAILWATER ELEV.U.S.G.S. LOCAL GAGE

SPILLWAY LENGTHS-FT. ~~30" Pipe~~ 80+60 FREEBOARD-FT. 1.0

FLASHBOARDS-TYPE,HEIGHT ABOVE CREST None

WASTE GATES-NO.	WIDTH	MAX.OPENING	DEPTH SILL BELOW CREST
1	3.0	2.5	14.5

REMARKS Condition Good.

3rd into Nameless Br. Seaver Reservoir, Chesham Pond, Minnewawa Br. Ashuelot R. Connecticut R.

POWER DEVELOPMENT

UNITS NO.	RATED HP	HEAD FEET	C.F.S. FULL GATE	KW	MAKE

USE Storage.

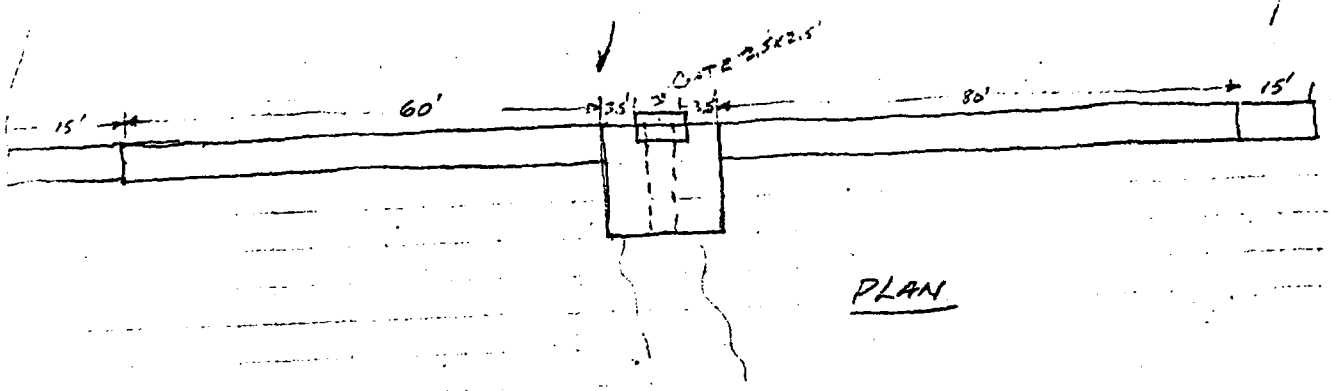
REMARKS Another walk of 1/4 mi after 3/4 mi on abandoned highway by car. Saw foundation of old Childs residence

DATE 1925 PSC

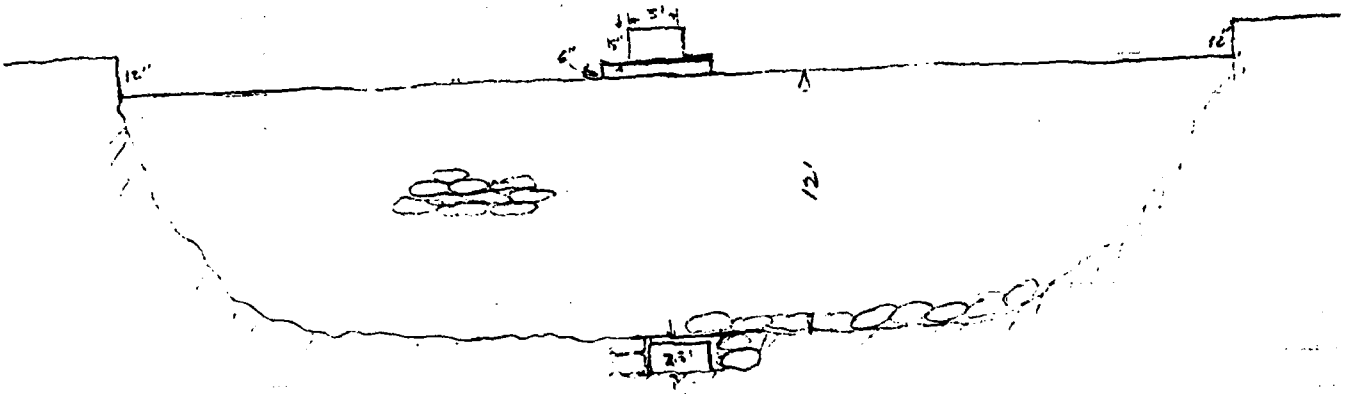
10/7/37 H. + J.H.S.

No

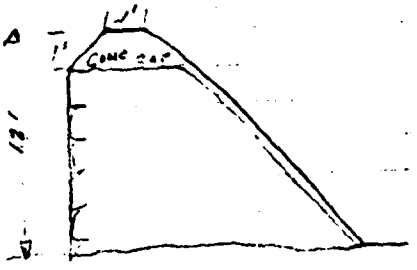
CHILDS RESERVOIR DAM – HARRISVILLE



PLAN



PROFILE



Inspected June 13, 1930.

Child's Reservoir owned by the
Public Service Company of New Hampshire

There is a very slight seepage from under the center which may be partly due to the fact that the gate is not entirely tight. The mechanical gates work O. K. The water level on the day of inspection showed a 3.9 foot draw dam. This is a stone dam capped with concrete, with a concrete apron upstream. The top concrete capping is cracked in four or five places in line with the expansion joints which are not carried to the top. There are a few slight cracks at the joints with the wing walls. The dam is in good condition.

DIVI-12

NEW HAMPSHIRE WATER CONTROL COMMISSION

Dams on Which Information is Available in the

Town of Harrisville

State No.	Location Stream	Name of Body of Water Created	Owner	Condition
109.01	Minnewawa Brook	Silver Lake	Breed Pond Reservoir Co.	Operable
109.02	" "	Chesham Pond	" " " "	"
109.03	Pratt Brook	Russell Reservoir	Gertrude M. Russell	"
109.04	Nubanusit Brook	----	Cheshire Mill	"
109.05	Pratt Brook	----	Gertrude M. Russell	Ruin
109.06	Minnewawa Brook	----	E. W. Seaver	"
109.07	Nubanusit Brook	----	W. C. Tolman	"
109.08	Nubanusit Brook	Harrisville Pond	Cheshire Mill	Operable
109.09	Nubanusit Brook	----	Ashuelot Nat'l Bank	Ruin
109.10	Nubanusit Brook	Skatutakee Lake	White Mills of N.H.	Operable
109.11	Minnewawa Brook	Seaver Reservoir	Pub.Ser.Co. of N.H.	"
109.12	Pratt Brook	Howe Reservoir	" " " " "	"
109.13	Br.Minnewawa Brook	Childs Reservoir	[redacted] " "	"
109.14	Nubanusit Brook	----	Cheshire Mill	

109.13

CHILD'S RESERVOIR

Child's Reservoir, Harrisville, N. H.
Keene Gas & Electric Co., Owners.
L. H. Shattuck, Inc., Constructors.
Begun Aug. 16, 1924, finished Oct. 18, 1924.

New construction, rock dam, down stream face abt. vertical, upstream face inclined. Excavation in earth to hard solid material for foundation for rock work, at heel of dam cutoff trench carried deeper in firm material to good bottom. Concrete cutoff walls carried up to intersection with upstream face. Concrete sills laid in upstream face from cutoff to crest flush with plane of face, concrete slab (reinforced) laid over upstream face with expansion joints over sills, crest, bulkheads and outlet through dam concrete. Construction somewhat similar to that of Howe reservoir. Progress good, workmanship good, materials of construction inspected and complied with standard requirements. Plans substantially followed. Vertical expansion joints constructed. See Plans.

See Progress reports Aug. 16 to Oct. 18, 1924, inclusive. Note Progress reports Oct. 24 to Nov. 24 inclusive pertain to Child's reservoir, road relocation, (old road will be flooded when reservoir is full)

Samuel J. Lord,

Oct. 25, 1924

Inspector.

1913

PUBLIC SERVICE COMMISSION

OF

NEW HAMPSHIRE

WILLIAM T. GUNNISON, CHAIRMAN
THOMAS W. D. WORTHEN
JOHN W. STORRS
COMMISSIONERS

WALTER H. TIMM, CLERK
MISS MARY A. NAWN
ASSISTANT CLERK

CONCORD

October 3, 1924.

Hon. John W. Storrs, Commissioner,
Public Service Commission,
Concord, N. H.

Dear Sir:

Childs Reservoir Dam (Ashuelot Gas & Electric Co.) Harrisville, N. H.

Rock Dam begun August 16, 1924, probably will be finished about October 10, 1924. Is in course of construction in accordance to plans entitled Ashuelot Gas & Electric Co., Minnewawa Development, Childs Reservoir Dam, Harrisville, N. H. L. H. Shattuck Inc. Engineers viz. 102-6 dated August 1924, 102-7 dated August 1924.

Samuel J. Ford Inspector.

Town No. 13 Town Harrisville No.

Data by L. W. B. File D-904

Owner Ashuelot Gas & Electric Co. (Childs Reservoir)

River or Stream Branch, Minnevawa Brook

Public Utility Yes Drainage area 1.4 sq. mi.

Wheel Capacity H. P. { Primary H. P. / 90% time }

Type of Construction Earth

Height 20 ft. Operating Head Storage ft.

Length 250 ft. Spillway Length (No. 1) 30" Pipe ft. (No. 2) ft.

Would Failure of Dam do Harm? Yes

Present Condition Good Date Oct. 1924

LWB Good 1925

7374

B-10

109.13

(1924)

Ashuelot Gas & Electric Co. Owners
L. H. Shattuck Co. Inc. Contractors
Harrisville, N. H.
Childs Reservoir

Started August 16, 1924. Completed October 16, 1924.
Plans filed June 10, 1924.

Permission given to go ahead with construction October 15, 1924.

Stripping was started August 28, 1924.

Rock fill wall started September 6, 1924. Finished October 1, 1924. Pouring concrete started September 10, 1924. Finished October 8, 1924.

This is a rock dam faced with concrete 20' in height and 250' in length. The drainage area is 1.4 sq. miles. This dam was built for storage purposes.

Informal 1637 Docket 904 Order 1618 Plan R-1298

KEENE GAS & ELECTRIC COMPANY

MINNEWAWA DEVELOPMENT

STORAGE RESERVOIRS

eservoir	Area acres	Draw ft.	Capacity million cu. ft.	Watershed sq. Miles Exclusive	Total
ilver Lake	342	8	111	2.3	2.3
[illegible]	120	14	52	[illegible]	1.35
Seaver Reservoir	42	18	20	.47	4.12
hisham Pond	70	8	15	4.03	8.15
aClapp Pond	20	13	8	1.19	1.19
ublin Pond	242	2	21	1.05	1.05
eMt. Brook Res.	300	8	65	4.93	5.98
owe Reservoir	195	14	65	4.53	10.51
a Russell Pond	39	12	12	.46	10.97
arlboro Pond	9	15	4	1.79	21.0
Total	1,379		373	22.10	

Proposed

a Too expensive for present construction

e Unsurveyed-Area, Draw & Capacity estimated

Develop a dam discharge rating curve using the weir section shown on page 4.

Assumptions:
* 'c' = 3.3
gates are closed
Spillway @ 1376' MSL
Normal storage = 1200 AC-FT
DA ≈ 1.4 mi²
* King & Brater Handbook Table 5-9 page 5-43

Trial #1 @ 1376 spillway
$Q = 0$ cfs

Trial #2 @ 1376.5 Top dam (top platform)
$Q = 3.3(157)(0.5)^{3/2}$
$Q = 183$ cfs

Trial #3 @ 1377
$Q = 3.3(157)(1.0)^{3/2} + 2.7(7)(0.5)^{3/2}$
$= 518 + 7 = 525$ cfs

Trial #4 @ 1377.5
$Q = 3.3(157)(1.5)^{3/2} + 2.7(7)(1.0)^{3/2} +$
$2.7(\frac{1}{2}70)(0.5)^{3/2} + 2.7(30)(0.5)^{3/2} +$
$2.7(\frac{1}{2}15)(0.5)^{3/2}$
$= 952 + 19 + 33 + 29 + 7 = 1040$ cfs

Trial #5 @ 1379
$Q = 3.3(157)(3.0)^{3/2} + 2.7(7)(2.5)^{3/2} +$
$2.7(3)(1.5)^{3/2} + 2.7(50)(2.0)^{3/2} +$
$2.7(\frac{1}{2}40)(1.5)^{3/2} + 2.7(\frac{1}{2}300)(2.0)^{3/2}$
$= 2692 + 75 + 15 + 382 + 99 + 1146$
$= 4409$ cfs

n-Nichols & Company, Inc. Subject Childs Bog

Sheet No. 1 of No
Date 5.21.79
Computed LAS
Checked

JOB NO. 3220-06

D.A. = 1.41 mi²
SIZE CLASSIFICATION = INTERMEDIATE
HAZARD CLASSIFICATION = SIGNIFICANT
TEST FLOOD = PMF

Calculate PMF using "Preliminary Guidance for Estimating Maximum Probable Discharges in Phase I Dam Safety Investigations, March 1978.

Slope of the watershed ≈ 1640'-1375' = 265' in 2.2 mi
≈ 120'/mi - no upstream storage
= MOUNTAINOUS CURVE USED.

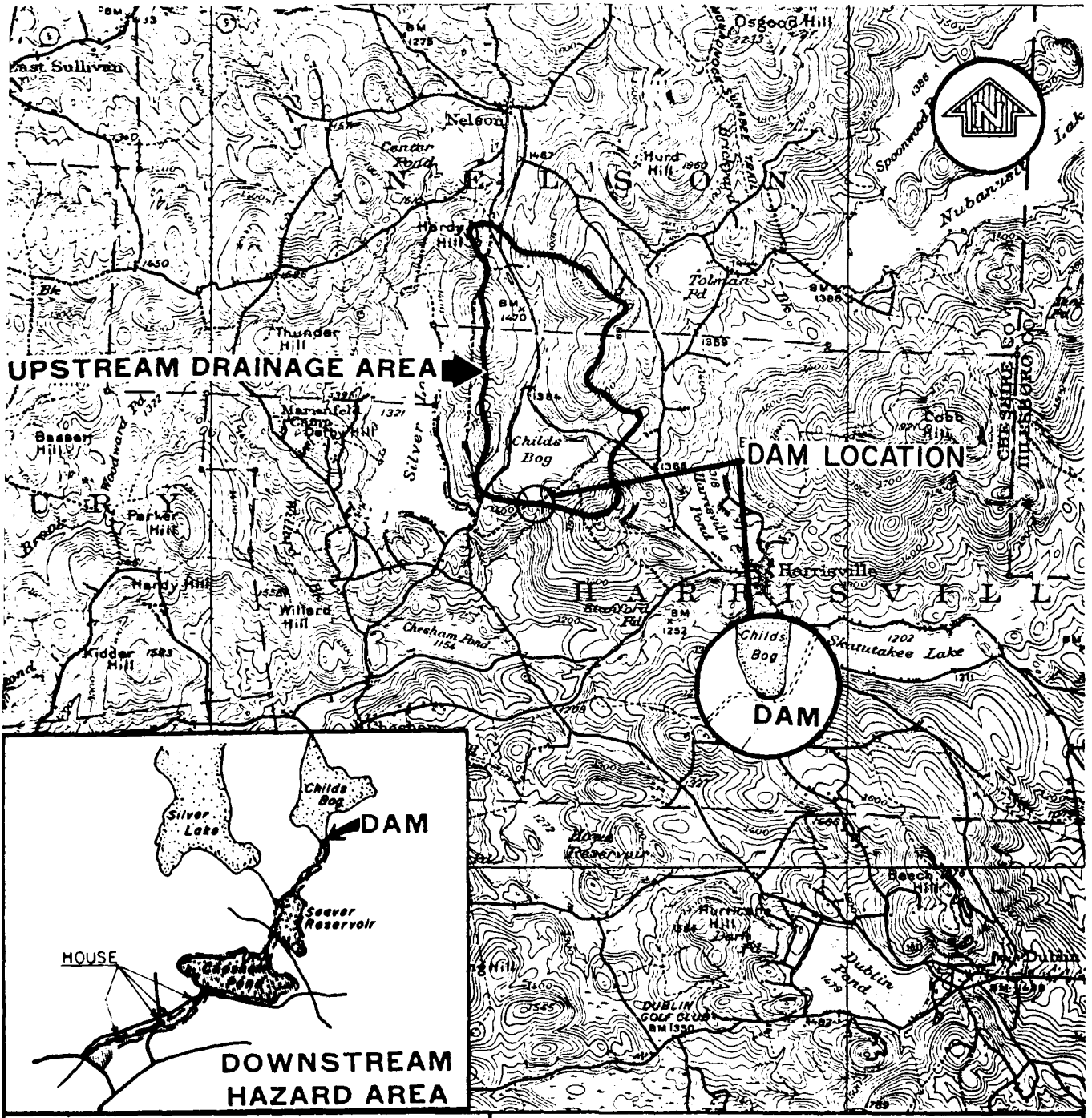
@ 1.4 mi², PMF in CFS/mi² = 2550=CSM

(1.4)(2550) = 3570 CFS
PMF = 3570 CFS

∴ PEAK INFLOW TO Childs Bog Reservoir = 3570 CFS

Route inflow to Childs Bog Reservoir to obtain outflow for test FLOOD.

Develop a rating curve for Childs Bog Dam assume uncontrolled.
Spillway elevation 1376' MSL
TOP OF DAM = 1377' MSL



NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

CHILDS BOG DAM
HARRISVILLE, NEW HAMPSHIRE

REGIONAL VICINITY MAP

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

ANDERSON-NICHOLS & CO., INC. CONCORD, NH

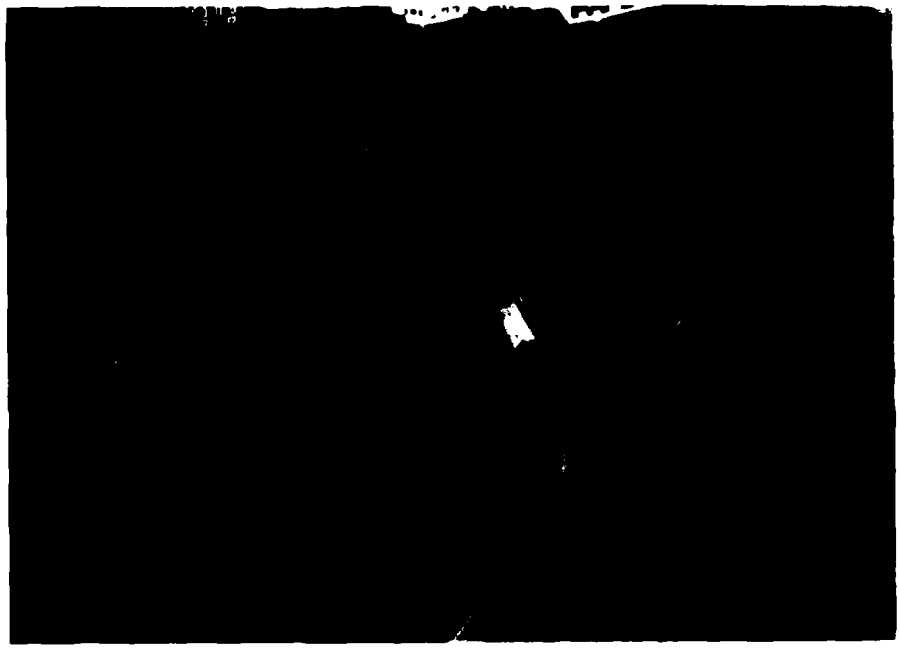
SCALE IN MILES

1 ½ 0 1 2

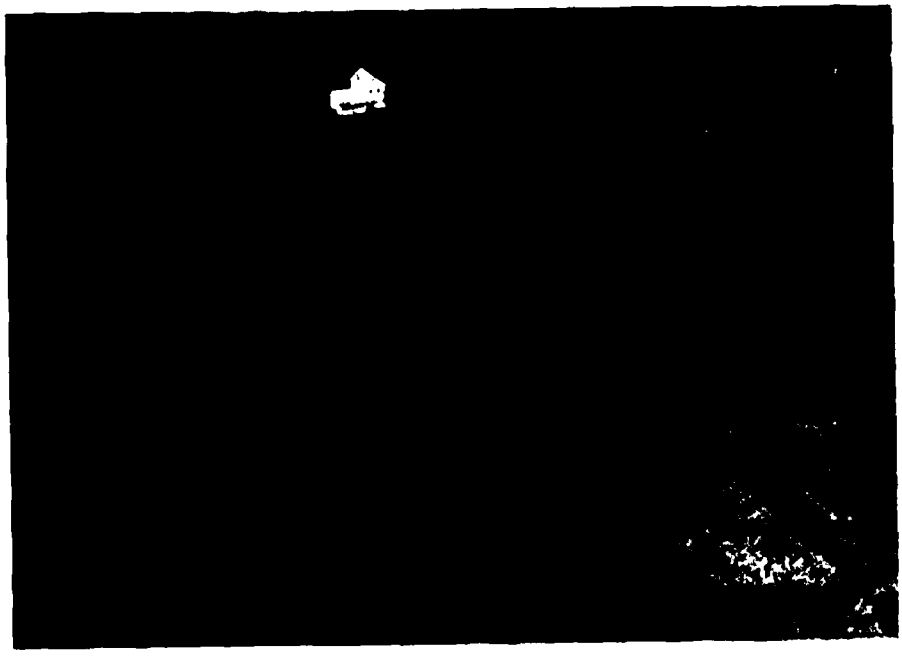
MAP BASED ON U.S.G.S. 15 MINUTE QUADRANGLE SHEET. MONADNOCK, N.H. 1949.

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS



October 1979
Figure 12 - Overview of the road crossing located one mile downstream of Chesham Pond Dam.



October 1979
Figure 13 - Overview of the reach between the two road crossings shown in Figures 11 and 12 above.

April 30, 1979

Figure 10 - Looking at the channel downstream of Figure 9.

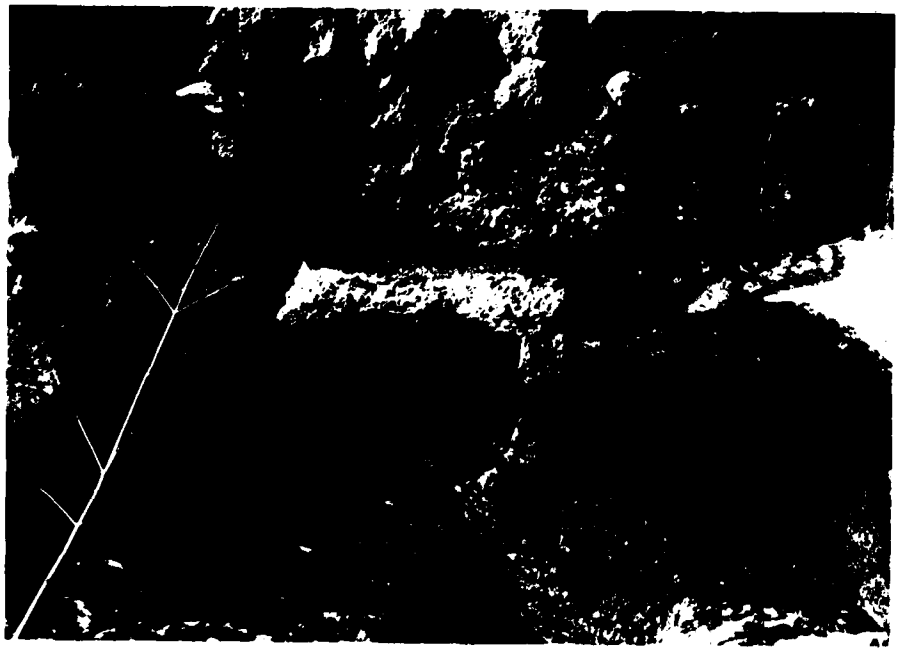
October 1979

Figure 11 - Overview of the road crossing located ½ mile downstream of Chesham Pond Dam.

April 30, 1979
Figure 8 - Looking upstream into the reservoir from the southwest abutment.

June 18, 1979
Figure 9 - View of the channel constriction downstream of the dam.

April 30, 1979
Figure 6 - Looking at the gate platform and operating mechanism.



April 30, 1979
Figure 7 - View of the low-level outlet. Note the spalled condition of the conduit.

April 30, 1979

Figure 4 - Looking southerly at the upstream face of the dam.

June 18, 1979

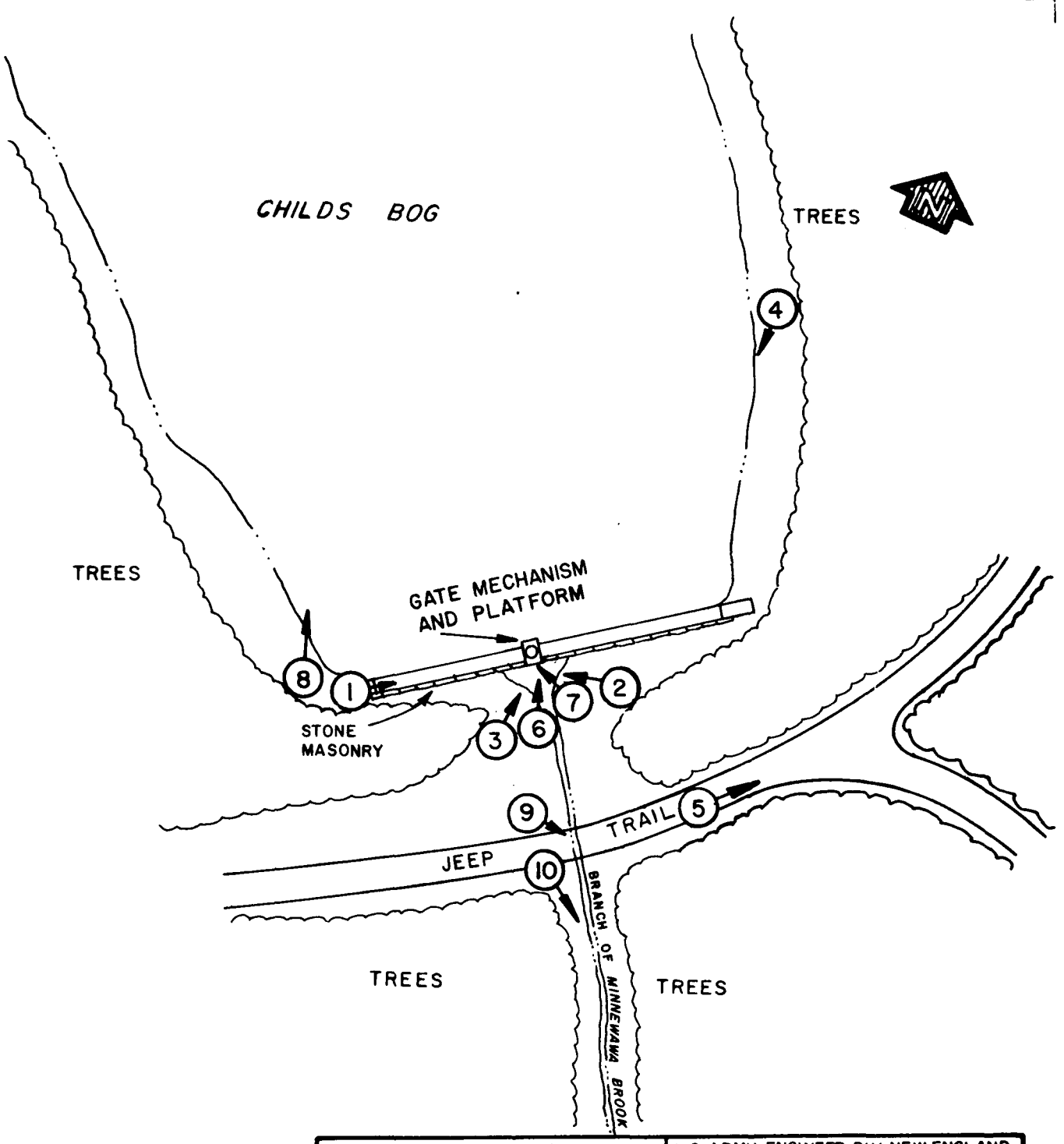
Figure 5 - View of the rutted and disturbed area on the left side of the valley downstream of the dam.

June 18, 1979

Figure 2 - Looking southwest along the downstream face of the dam.

June 18, 1979

Figure 3 - Looking at the downstream face of the dam and gate platform. Note gate operating mechanism.



Anderson - Nichols & Co., Inc. CONCORD NEW HAMPSHIRE	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MA.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

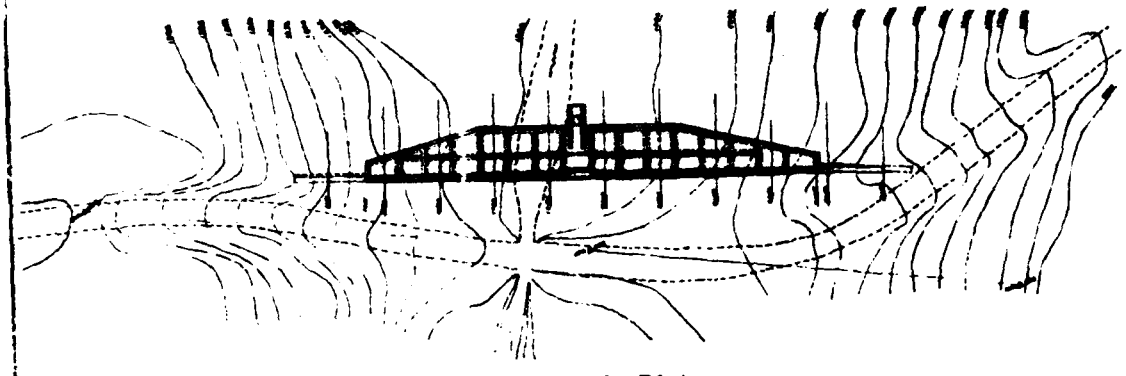
CHILDS BOG DAM PHOTO INDEX

BRANCH OF MINNEWAWA BROOK NEW HAMPSHIRE

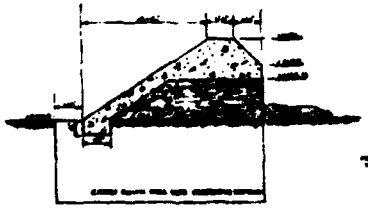
SCALE	NOT TO SCALE
DATE	JULY, 1979

APPENDIX C

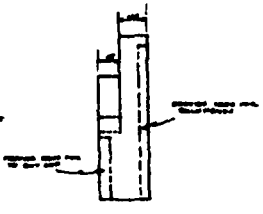
PHOTOGRAPHS



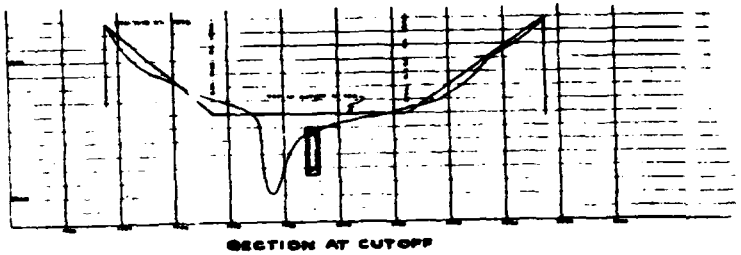
PLAN OF DAM



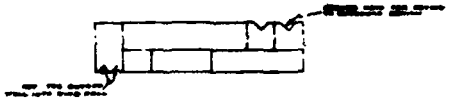
SIDE VIEW



END VIEW



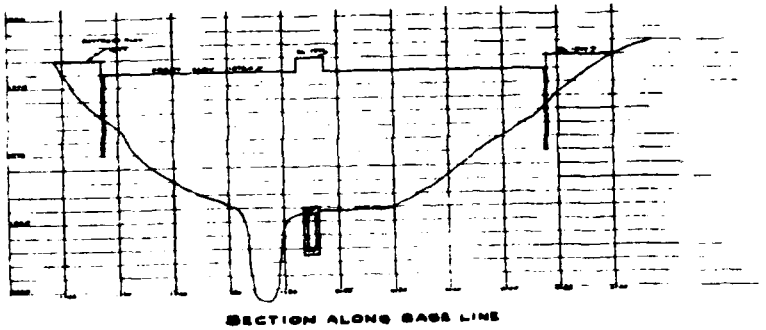
SECTION AT CUTOFF



PLAN VIEW

END WING WALLS

SCALE



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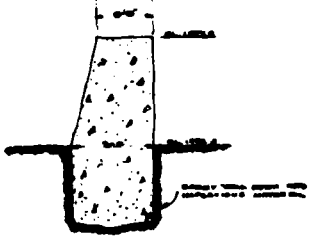


BULKHEAD SECTION

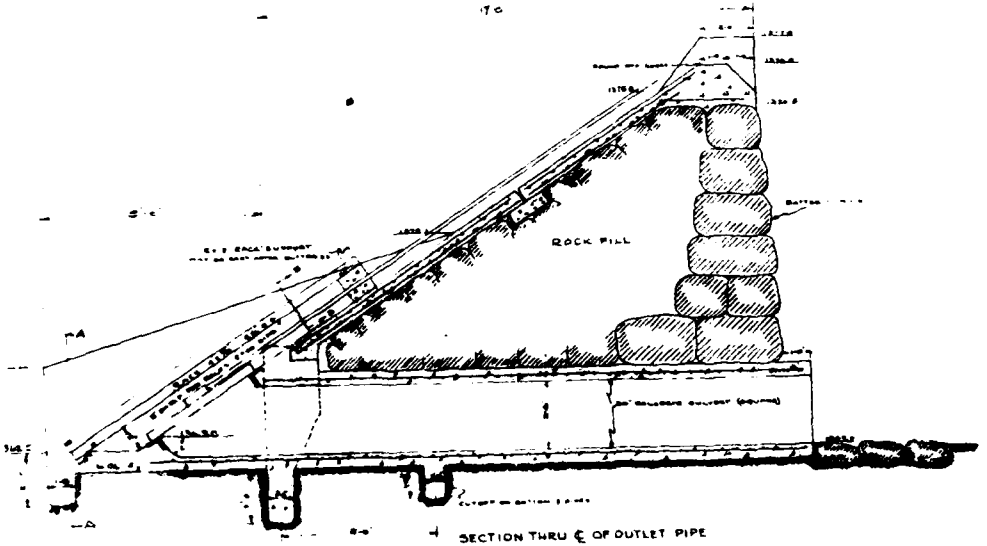
SCALE

ASHUELOT GAS & ELECTRIC CO.

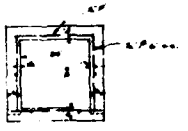
CHILDS RESERVOIR DAM

PLAN & SECTIONS

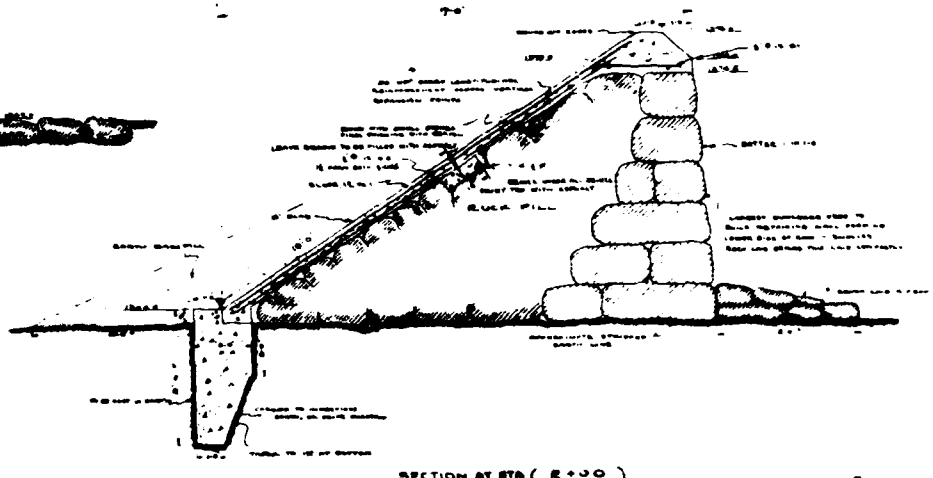
AUGUST 1924



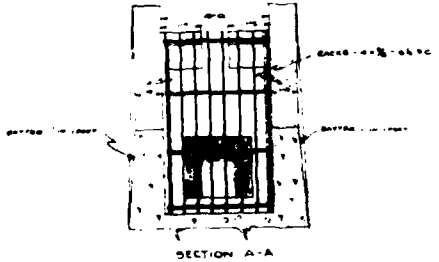
SECTION THRU ℄ OF OUTLET PIPE



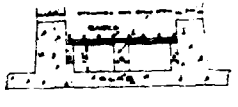
SECTION THRU CULVERT



SECTION AT STA (8+00)



SECTION A-A



SECTION B-B

ASHUELOT GAS & ELECTRIC CO.

CHILDS RESERVOIR DAM

SECTIONS

102-6

Anderson-Nichols & Company, Inc.

Subject _____

Sheet No. 3 of 16
Date _____
Computed _____
Checked _____

JOB NO.

JARES IN. SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

Use the above trials to establish a dam discharge rating curve.
See page 5/16.

NO. 31,282 10 DIVISIONS PER INCH BOTH WAYS 80 & 20 DIVISIONS
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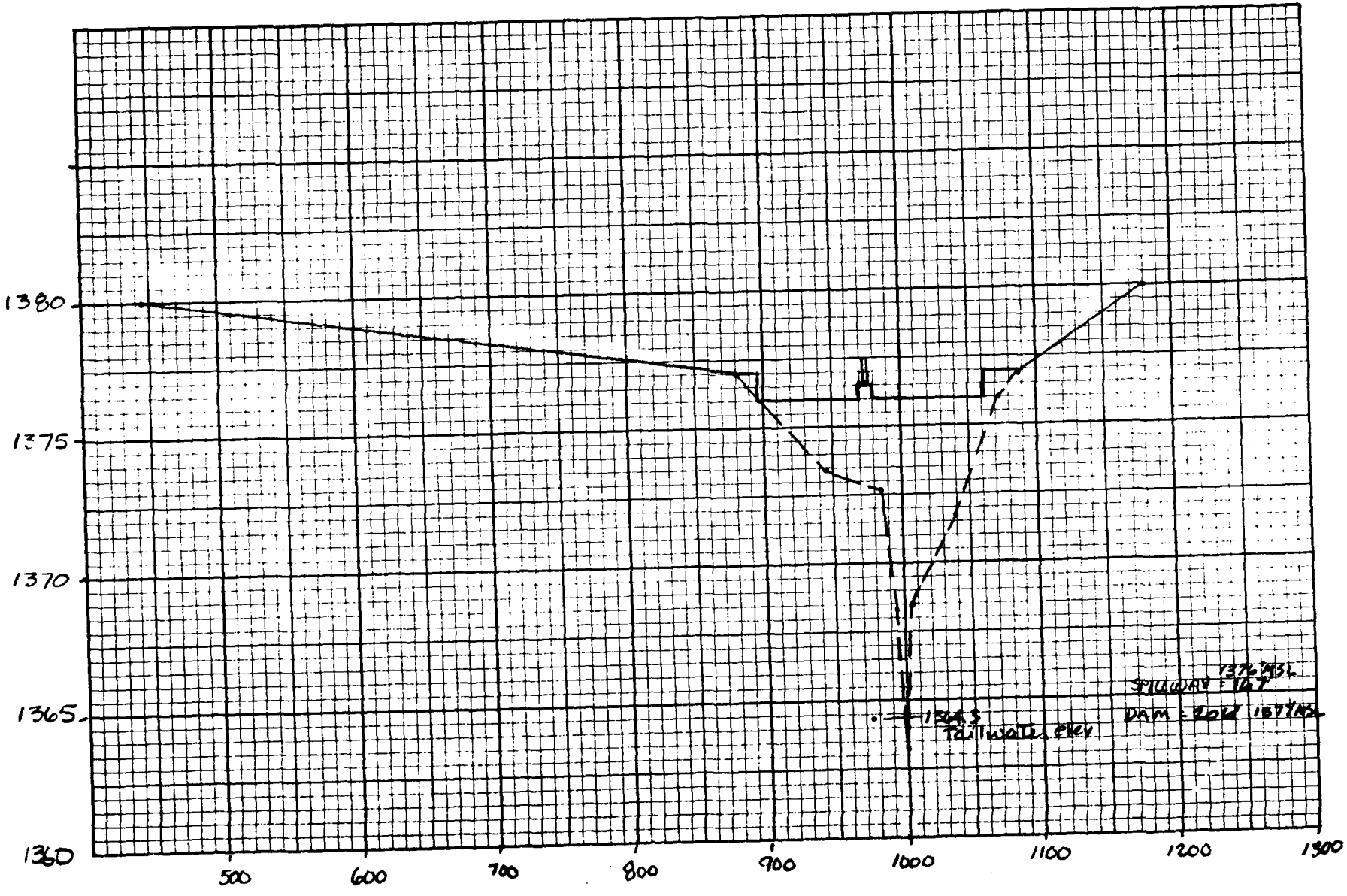
Childs Bog Dam
3220-06
5·30·79



D-5

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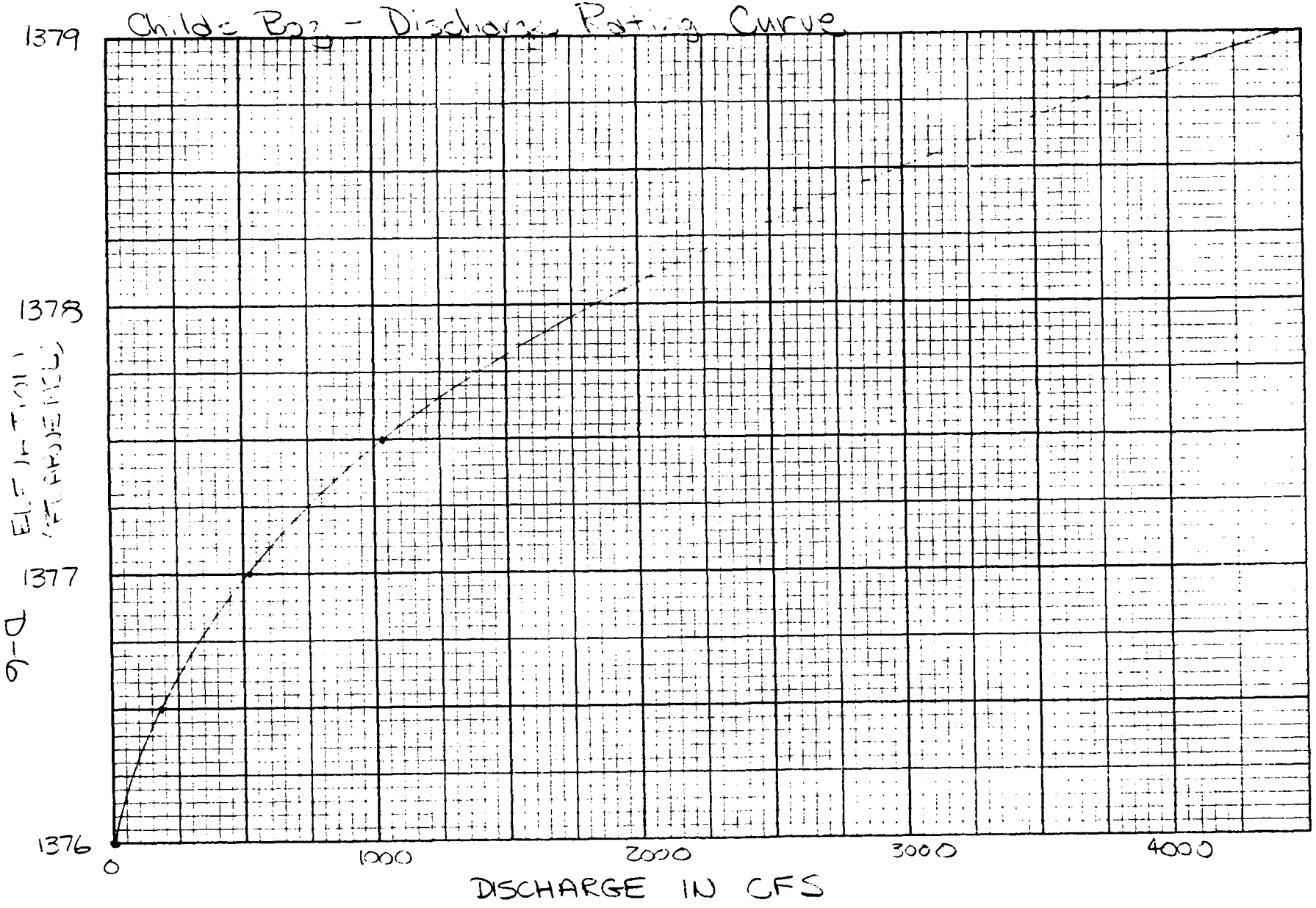


SQUARES 1/4 IN. SCALE

Determine Volume of Surcharge in Inches of Runoff:

Assume Normal Storage at elevation 1376'MSL TO BE 1200 AC-FT FROM INVENTORY SHEET.

Surface Area = 134 acres

"Frustrum of Pyramid" for storage-elevation curve

$V = \frac{1}{3}h(b_1 + b_2 + \sqrt{b_1 b_2})$

h = elev. above normal pool
b_1 = normal pool S.A. (acres)
b_2 = enlarged S.A. (acres)

@ 1380'MSL S.A. = 166 acres

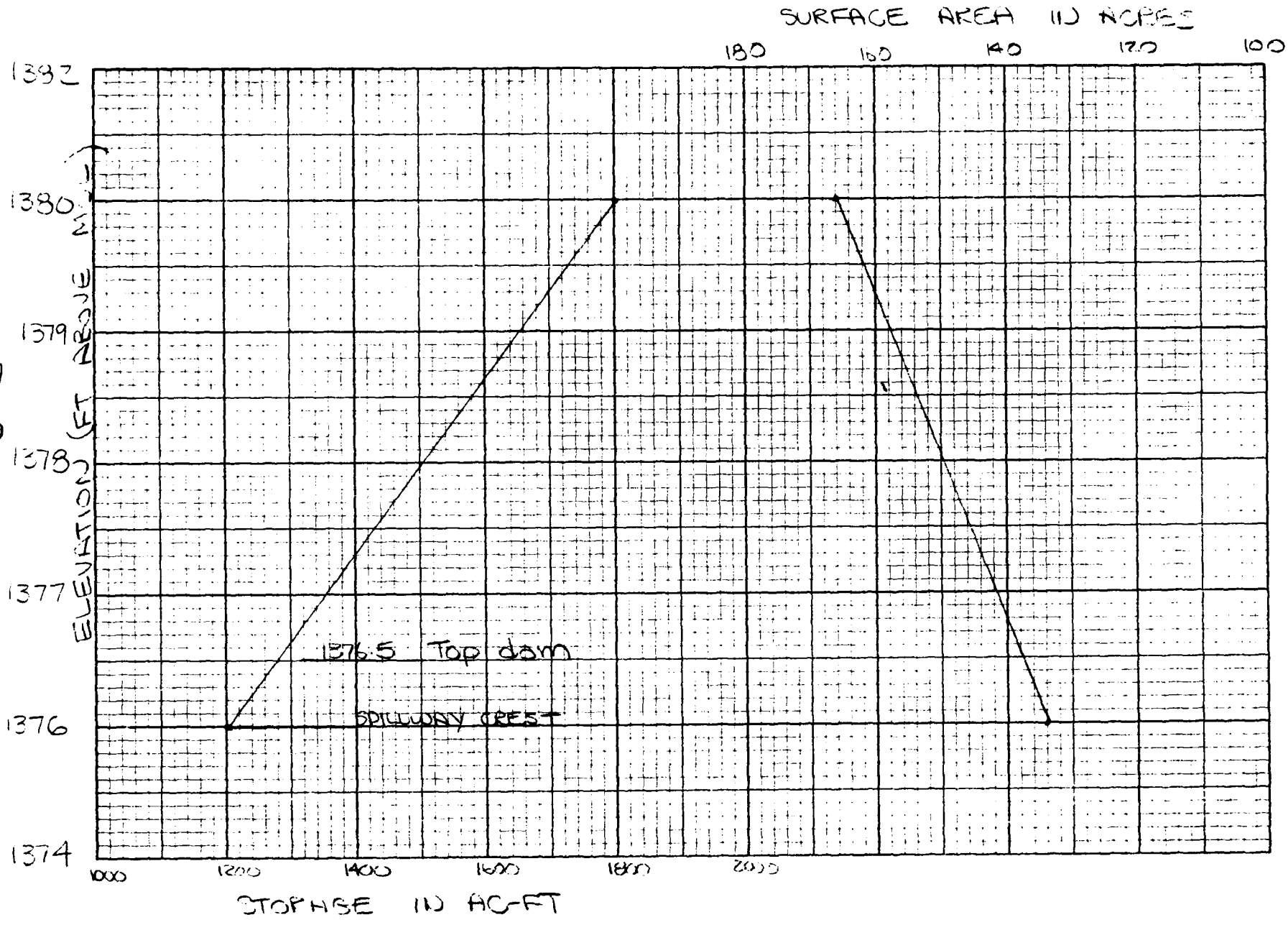
$V = \frac{1}{3}(4)\left[(134) + (166) + \sqrt{(134)(166)}\right]$

$V = 599$ AC-FT + 1200 = 1799 AC-FT

@ 1400'MSL SA. = 192 acres

$V = \frac{1}{3}(20)\left[(166) + (192) + \sqrt{(166)(192)}\right] + 1799$

$= 3577 + 1799 = 5376$ AC-FT


SURFACE AREA IN ACRES
180
160
140
120
100
1382
1380
1379
1378
1377
1376
1374
ELEVATION (FT ABOVE MSL)
1376.5 Top dam
SPILLWAY CREST
1000
1200
1400
1600
1800
2000
STORAGE IN AC-FT

ROUTING

For PMF INFLOW OF 3510CFS (Q_{p_1}) at Childs Bog, an elevation of 1378.7' MSL is read from the rating curve.

A storage of 1610 AF is read from the storage-elevation curve.

A storage of 1200AF is read from the storage-elevation curve at normal pool = 1376' MSL.

TO CONVERT TO INCHES OF RUNOFF:

1610
1200
410 AF

$410\,AF \times \frac{1}{1.4mi^2} \times \frac{1\,mi^2}{640\,AC} = .458' = STOR\ 1$

$.458' \times 12''/ft = 5.49''$

$Q_{p_2} = Q_{p_1} \times \left(1 - \frac{stor\,1}{19}\right) = Q_{p_1} \times \left(1 - \frac{5.49}{19}\right)$

$Q_{p_2} = 2540CFS$

Determine surcharge height to pass Q_{p_2} = 1378.3' MSL FROM RATING CURVE.

DETERMINE STORAGE @ 1378.3' MSL FROM STORAGE ELEVATION CURVE = 1550' AC-FT.

TO CONVERT TO INCHES OF RUNOFF:

1550
1200
350

$350.1CFT \times \frac{1}{1.4mi^2} \times \frac{1\,mi^2}{640AC} = .391' = 4.69''$

$STOR_2 = 4.69''$

STOR 1 = 5.5"
STOR 2 = 4.7"

5.1" AVE = .425'

$(.425')(1.4\ mi^2)\left(\frac{640\ AC}{mi}\right) = 380\ AC\text{-}ft$

from storage elevation curve:
ELEV: 1378.5' MSL

1200
380
1580 AC-FT

From rating curve:
OUTFLOW Q = 3000 cfs, ELEV 1378.5' MSL = TEST FLOOD ELEV

1378.5
1376. SPILLWAY
2.5' over spillway

1378.5
1376.5 TOP DAM
2.0' over TOP DAM

The water depth over the spillway during PMF test flood would be about 2.5. The dam should be overtopped by 2.0 feet during the PMF test flood.

RES SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

BREACH ANALYSIS

STORAGE AT MAXIMUM POOL: 1280 AC-FT
STORAGE AT NORMAL POOL: 1200 AC-FT

D.A. = 1.4 mi^2

$Q_p = 8/27\ W_b \sqrt{g}\ y_o^{3/2}$

$Q_{p_1} = 8/27\ (82)\sqrt{32.2}\ (9.5)^{3/2}$
$= 4337$ CFS

W_b = breach width
$g = 32.2$ ft/sec^2
y_o = pool elev − u/s riverbed
Dam length = 206'
$f_{0.9}o = 82'$

C_e over SPILLWAY not breached:
$Q = CLH^{3/2}$ @ 1376.5 msl
$Q = (3.3)(85)(0.5)^{3/2} = 99$ CFS

MAX POOL = 1376.5' msl
1376.5
1367.0
9.5 = y_o

TOTAL BREACH Q @ MAX POOL =
4337 + 99 = 4436 CFS, SAY 4435 CFS

4435 CFS ON rating curve: 9.4' STAGE

Antecedent discharge = $CLH^{3/2}$ =
$= 3.3(157)(0.5)^{3/2}$
183 CFS = 2' STAGE ON RATING CURVE

9.7'
2.0
7.7'

THEREFORE INCREASE IN STAGE = 7.4' WITH A BREACH

The 7.4' increase in stage downstream could cause an increase in stage at Seaver Reservoir, a possible breach there, and ultimately a domino effect downstream to Chesham Pond. There are several inhabited structures at low elevations on Chesham Pond. The upstream breaching of Childs Bog Reservoir Dam and Seaver Reservoir Dam could cause signifi-

property damage with a possibility of loss of life.

Seaver Pond surface area, = 45 ACRES
Storage (top dam) Childs = 1280 AC-FT
Therefore, maximum rise of Seaver Pond caused by breach of Childs would be 28 feet.

on-Nichols & Company, Inc. Subject _____ Sheet No. 12 of 16

JOB NO. 3220-06 CHILDS BOG DAM Date 6.29.79

Computed KBS

Checked _____

TYPICAL DOWNSTREAM X-SECTION

use typical cross-section along downstream reach from the dam to Scarey Reservoir and establish a discharge rating curve using Mannings Equation:

$$Q = \frac{1.49}{n} \cdot A \cdot R^{2/3} \cdot S^{1/2}$$

n = composite 'n' value
A = area of section (ft^2)
R = A/wetted perimeter)
S = slope of reach

Length of reach: 1320'
ELEV @ DS TOE: 1365.3' MSL
Elev @ end reach: 1240' MSL
SLOPE: 0.09'/FT
COMPOSITE 'n' = 0.07

TRIALS BELOW refer to the DS HAZARD CROSS SECTION on page 14.

TRIAL #1 assume STAGE = 2'
area = 30 ft^2
WP = 34
R = A/WP = 0.88
Q = 176 CFS

$Q = \frac{1.49}{.07}(30)(.88)^{2/3}(.09)^{1/2}$
Q = 176 CFS

TRIAL #2 Assume stage = 4'
area = 50 ft^2
WP = 31
R = A/WP = 50/31 = 1.61
Q = 447 + 176 = 623 CFS

$Q = \frac{1.49}{.07}(50)(1.61)^{2/3}(.09)^{1/2}$

Q = 447

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

D/S SECTION (CON'T)

TRIAL # 3 ASSUME STAGE = 6'
AREA = 124 FT²
WP = 45
R = A/WP = 2.76
Q = 1585 + 176 = 1761 CFS

$Q = \frac{1.49}{.07}(124)(2.76)^{2/3}(0.09)^{1/2} =$
1585

TRIAL # 4 ASSUME STAGE = 8'
AREA = 232
WP = 72
R = A/WP = 232/72 = 3.22
Q = 3261 + 176 = 3437 CFS

$Q = \frac{1.49}{.07}(232)(3.22)^{2/3}(.09)^{1/2} =$
3261

TRIAL # 5 ASSUME STAGE = 10'
AREA = 412
WP = 112
R = A/WP = 412/112 = 3.68
Q = 4785 + 176 = 4961

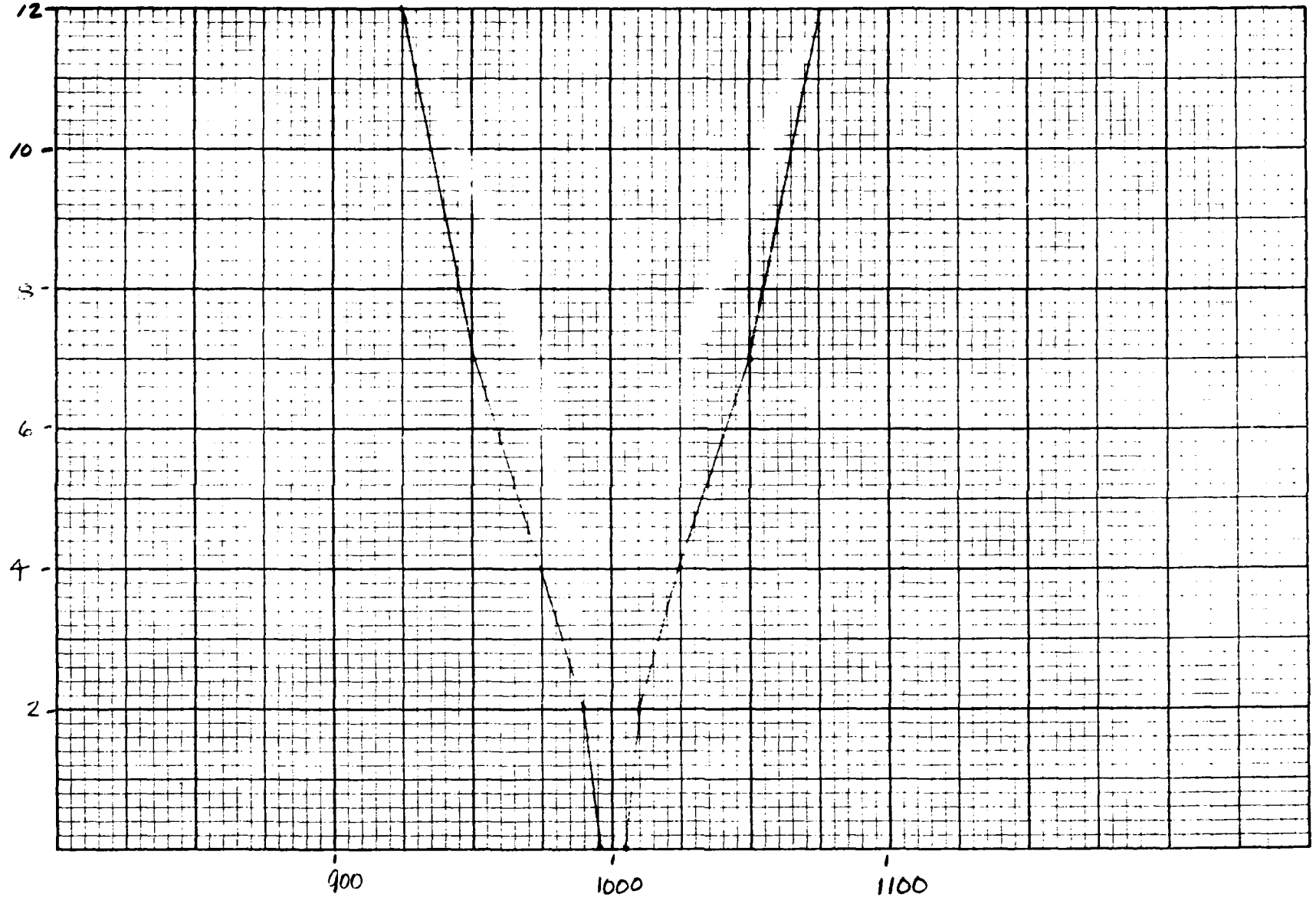
$Q = \frac{1.49}{.07}(312)(3.68)^{2/3}(.09)^{1/2}$
= 4785

TRIAL # 6 ASSUME STAGE = 12'
AREA = 572
WP = 152
R = A/WP = 3.76
Q = 8772 + 176 = 8948

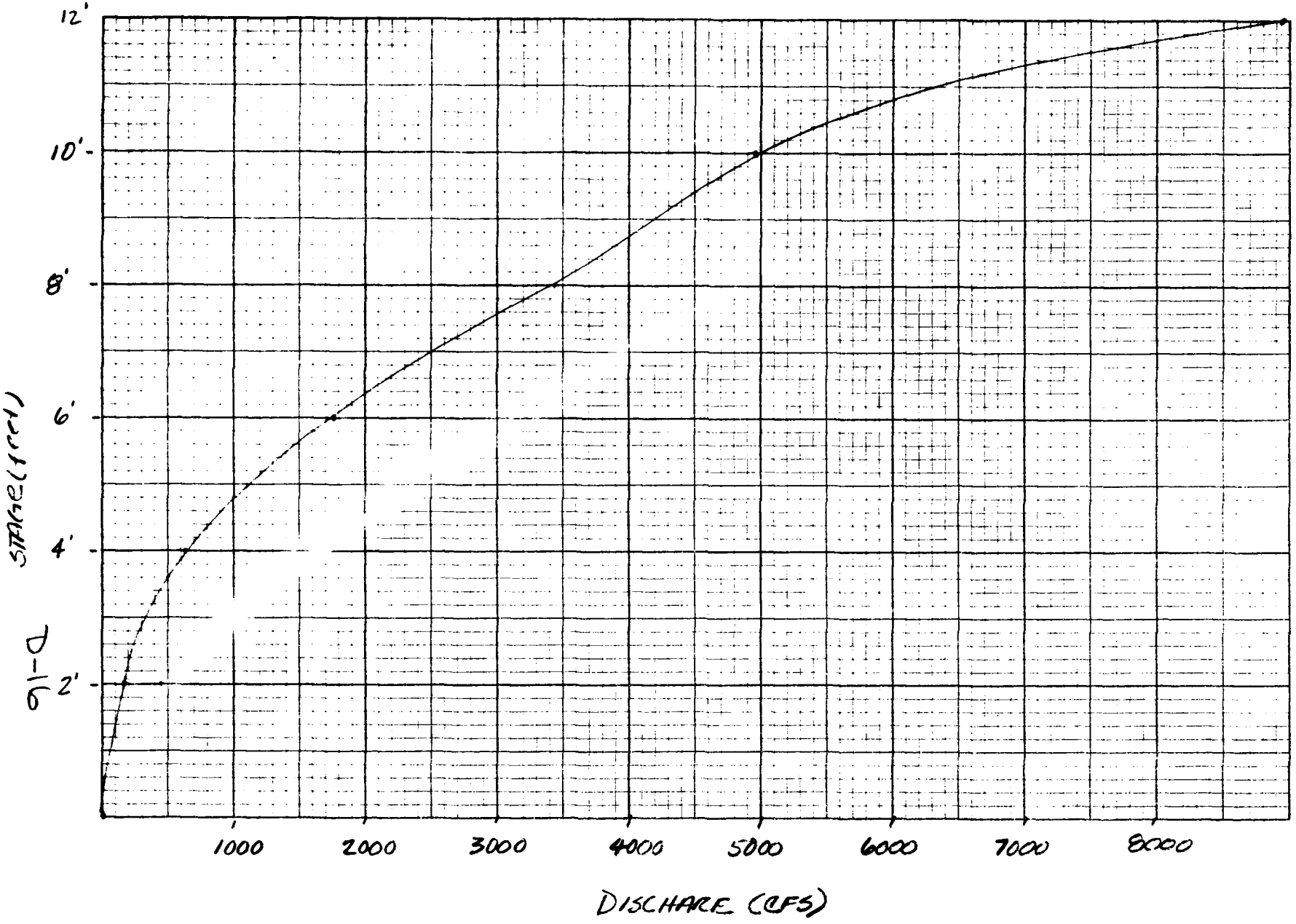
$Q = \frac{1.49}{0.07}(512)(3.76)^{2/3}(.09)^{1/2} =$
8772

DOWNSTREAM X-SECTION

CHILDS BAG DAM



CURVE K05



D-16

15 OF 16

2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

GATE CAPACITIES

Determine approximate discharge capacities of gates @ top dam - 1376.5' MSL

OUTLET PIPE
2'6" H x 2'6" W = 6.3 ft²
INVERT OF PIPE = 1362' MSL
centerline of PIPE: 1363.3' MSL

Capacity @ TOP DAM - 1376.5' MSL

$Q = CA\sqrt{2gh}$

$Q = (.7)(6.3)\sqrt{64.4(13.2)}$

$Q = 130$ CFS

C=0.7
g=32.2
A=area
h=head

tage (ft. above invert)	Discharge (cfs)
12.5	$Q_{ORIFICE} = (0.8)(10.5)\sqrt{64.4 \times 7.25} = 1,755$ $Q_{weir} = 2.7(2\frac{1}{2})(2.0)^{3/2} + 2.7(\frac{1}{2}4\frac{1}{2})(2.0)^{3/2} +$ $2.7(\frac{1}{2}10)(2.0)^{3/2} = 1,806$ $Q_{TOTAL} = 3,561$ cfs
14.0	$Q_{ORIFICE} = (0.8)(10.5)\sqrt{64.4 \times 8.75} = 1,928$ $Q_{weir} = 2.7(2\frac{1}{2})(3.5)^{3/2} + 2.7(\frac{1}{2}7\frac{1}{2})(3.5)^{3/2} +$ $2.7(\frac{1}{2}16)(3.5)^{3/2} = 4,535$ $Q_{TOTAL} = 6,463$

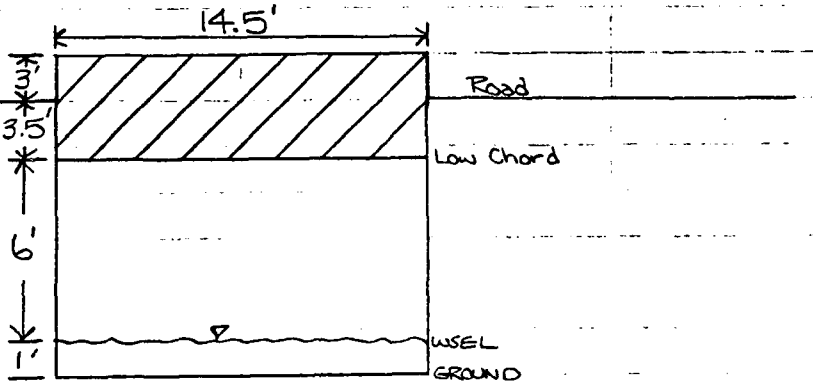
ing the above trials, establish a stage/discharge lationship. See curve on sheet 8.

each $Q \approx 5,517$ cfs Stage $\approx$ 13.5 feet
ecedent $Q \approx 535$ cfs (Dedham) Stage $\approx$ 5.2 feet
rease due to breach would be $\approx$ 8.3 feet. This ease would overtop the gravel road by eet, possibly causing damage to roadway and vert. The breach wave itself would be enuated in this area due to large storage ind. The 2nd road crossing would act as dam and cause this area to fill up, sing a lessened effect downstream.

; analysis, in conjunction with the HEC-1 lysis, supports the appropriate hazard sification of Childs Bog as Significant.

aluate capacity of box culvert located about
ıe mile downstream of Chesham Pond Dam.

ad width = 18'
el Road on left side



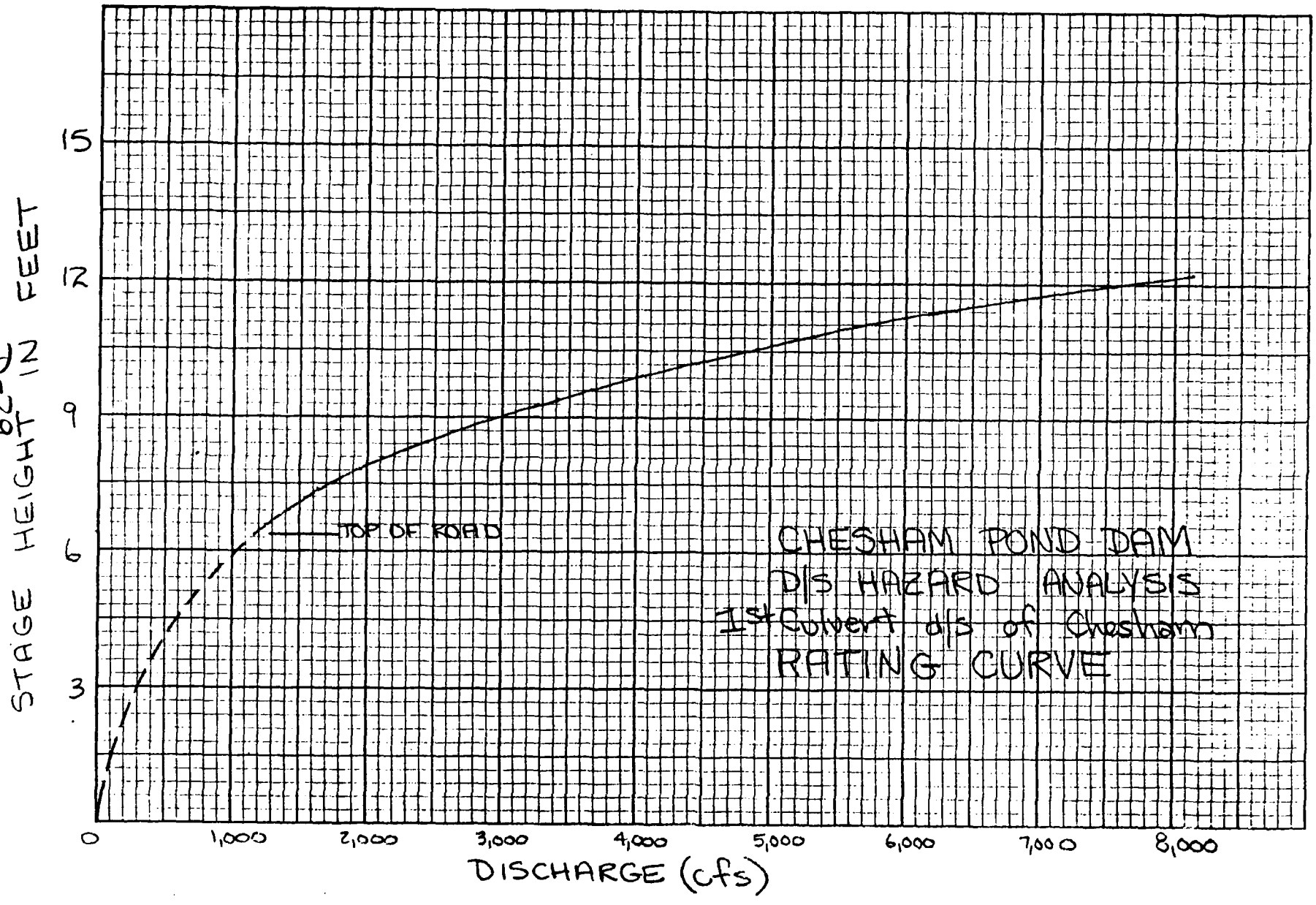
e the orifice equation to determine the
pacity of the culvert at top of road.

$$Q = CA\sqrt{2gh}$$

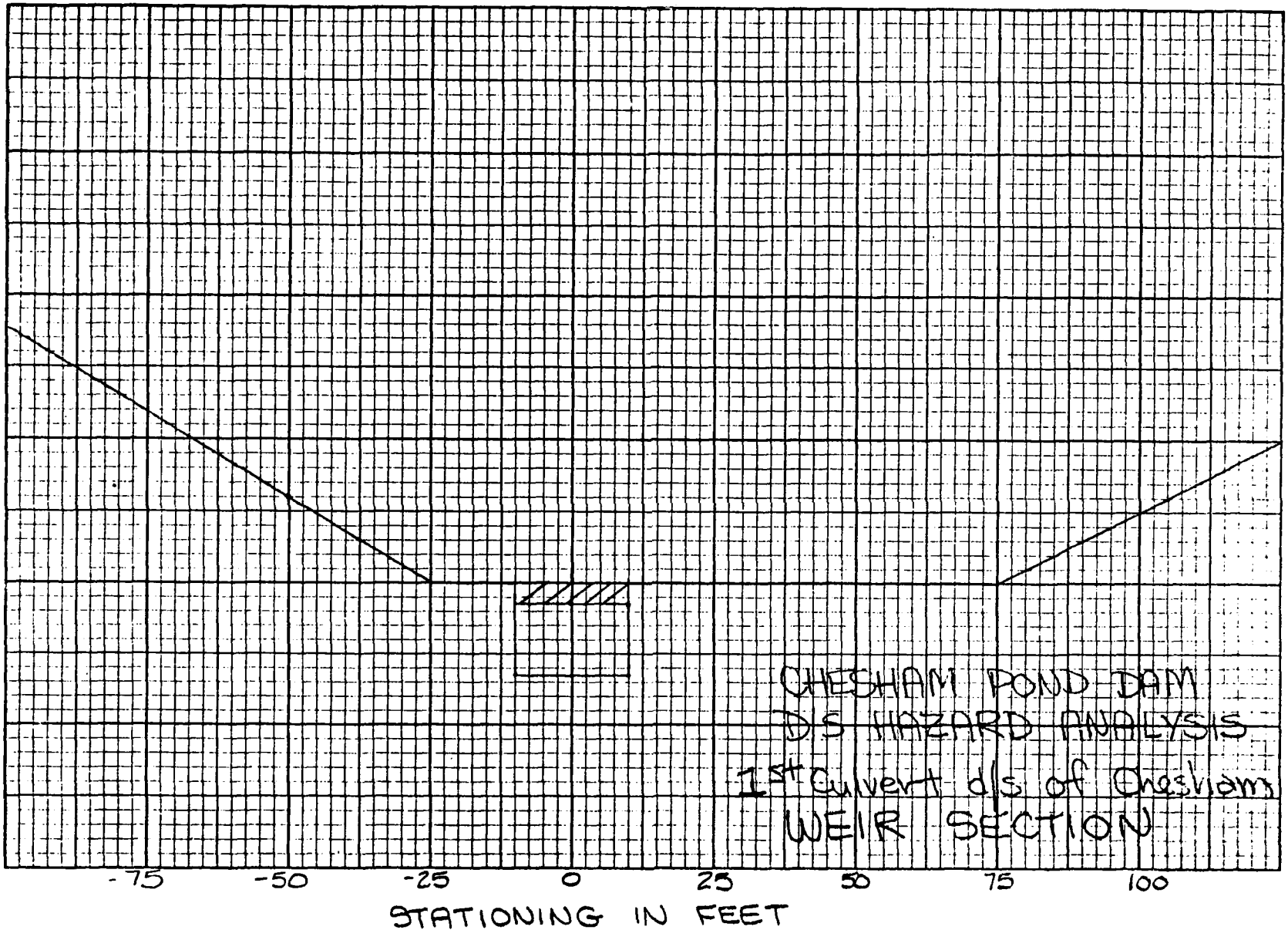
$$Q = (0.8)(101.5)\sqrt{64.4 \times 5.25} = 1{,}493 \text{ cfs}$$

each Q through reach ≈ 5,500 cfs. Therefore,
lvert will not carry breach Q. Weir flow
l occur over the road along with pressure
w through the culvert. Develop a rating curve
the weir cross section shown on Sheet 7.
e weir equation $Q = CLH^{3/2}$ to rate flow over
dway. Assume 'c' is ≈ 2.7.

ge (ft. above invert)	Discharge (cfs)
0	0
10.5 (top of road)	$Q_{ORIFICE} = 1{,}493$
11.5	$Q_{ORIFACE} = (0.8)(101.5)\sqrt{64.4 \times 6.25} = 1629$ $Q_{weir} = 2.7(211)(1.0)^{3/2} + 2.7(\frac{1}{2}20)(1.0)^{3/2} + 2.7(\frac{1}{2}5)(1.0)^{3/2} = 603$ $Q_{TOTAL} = 2096$ cfs



Sheet 4 of 8
LWilliams
4/16/80

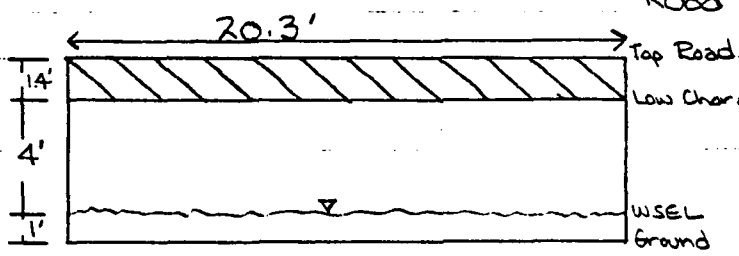

82-D
FEET ABOVE TOP OF ROAD
10
5
0
-75
-50
-25
0
25
50
75
100
STATIONING IN FEET
CHESHAM POND DAM
D/S HAZARD ANALYSIS
1st Culvert d/s of Chesham
WEIR SECTION

Stage	Discharge (cfs)
8.4	$Q_{ORIFICE} = (0.8)(101.5)\sqrt{64.4 \times 5.2} = 1485$ $Q_{WEIR} = 2.7(100)(2.0)^{3/2} + 2.7(\frac{1}{2}16)(2.0)^{3/2} + 2.7(\frac{1}{2}20)(2.0)^{3/2}$ $= 901$ $Q_{TOTAL} = 2,386$
9.4	$Q_{ORIFICE} = (0.8)(101.5)\sqrt{64.4 \times 6.2} = 1,623$ $Q_{weir} = 2.7(100)(3.0)^{3/2} + 2.7(\frac{1}{2}25)(3.0)^{3/2} + 2.7(\frac{1}{2}30)(3.0)^{3/2} = 1,789$ $Q_{TOTAL} = 3,412$
11.4	$Q_{ORIFICE} = (0.8)(101.5)\sqrt{64.4 \times 8.2} = 1,866$ $Q_{weir} = 2.7(100)(5.0)^{3/2} + 2.7(\frac{1}{2}41)(5.0)^{3/2} + 2.7(\frac{1}{2}50)(5.0)^{3/2} = 4,392$ $Q_{TOTAL} = 6,258$
12.4	$Q_{ORIFICE} = (0.8)(101.5)\sqrt{64.4 \times 9.2} = 1,976$ $Q_{weir} = 2.7(100)(6.0)^{3/2} + 2.7(\frac{1}{2}50)(6.0)^{3/2} + 2.7(\frac{1}{2}60)(6.0)^{3/2} = 6,151$ $Q_{TOTAL} = 8,127$

Using the above trials, establish a stage/discharge curve. (See Sheet 4.)

Breach Q = 5,570 Stage ≈ 11.0 feet
Antecedent Q (Qresham) ≈ 535 cfs Stage ≈ 4.2
Increase in stage due to breach ≈ 6.8 feet at 1st d/s road crossing causing the road to be overtopped by 4.6 feet. Some damage to the road and structure could result.

Evaluate capacity of box culvert located about ½ mile downstream of Chesham Dam.
Road width = 35'



Use the orifice equation to determine the capacity of the culvert at top of road.

$$Q = CA\sqrt{2gh}$$
$$Q = (0.8)(101.5)\sqrt{64.4 \times 3.2} = 1165 \text{ cfs}$$

Breach Q through reach ≈ 6,470 cfs Therefore, the culvert will not carry the breach Q. Weir flow will occur over the road along with pressure flow through the culvert. Develop a rating curve for the weir cross section shown on Sheet 3. Use weir equation $Q = CLH^{3/2}$, where $C \approx 2.7$.

Stage (ft. above invert)	Discharge (cfs)
0	0
6.4 (top road)	$Q_{ORIFICE} = 1,165$
7.4	$Q_{ORIFICE} = (0.8)(101.5)\sqrt{64.4 \times 4.2}$ $Q_{ORIFICE} = 1,335$ $Q_{weir} = 2.7(100)(1.0)^{3/2} + 2.7(10)(1.0)^{3/2}$ $= 297$ $Q_{TOTAL} = 1,632$

PLAN 1 STATION A13

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	5793.	1087.4	3.42

PLAN 2 STATION A13

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	5393.	1087.1	3.58

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ..... INITIAL VALUE SPILLWAY CREST TOP OF DAM

ELEVATION	1156.40	1154.00	1156.40
STORAGE	460.	389.	460.
OUTFLOW	534.	0.	534.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1156.42	.02	464.	6195.	.21	2.83	0.00

PLAN 2 ..... INITIAL VALUE SPILLWAY CREST TOP OF DAM

ELEVATION	1156.40	1154.00	1156.40
STORAGE	460.	389.	460.
OUTFLOW	534.	0.	534.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1161.08	5.68	824.	5834.	8.33	2.92	0.00

PLAN 1 STATION A11

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	5774.	1141.8	3.00

PLAN 2 STATION A11

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	5774.	1141.8	3.00

PLAN 1 STATION A12

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	5895.	1139.3	3.17

PLAN 2 STATION A12

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	5517.	1139.1	3.33

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SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1204.30	1201.00	1204.30
STORAGE	674.	466.	674.
OUTFLOW	824.	0.	824.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1207.15	2.85	853.	7178.	4.08	2.42	0.00

PLAN 2 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1204.30		
STORAGE	674.	466.	674.
OUTFLOW	824.	0.	824.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1207.15	2.85	853.	7178.	4.08	2.42	0.00

PLAN 1 STATION A7

RATIO OF PMF	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	7175.	1166.5	2.42

PLAN 2 STATION A7

RATIO OF PMF	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	7175.	1166.5	2.42

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS .67 1.00
HYDROGRAPH AT	A6	0.00	1	7582.
		(0.00)		(214.70)(
			2	7582.
				(214.70)(
ROUTED TO	A6	0.00	1	7178.
		(0.00)		(203.27)(
			2	7178.
				(203.27)(
ROUTED TO	A7	0.00	1	7175.
		(0.00)		(203.18)(
			2	7175.
				(203.18)(
ROUTED TO	A10	0.00	1	6195.
		(0.00)		(175.41)(
			2	5834.
				(165.20)(
ROUTED TO	A11	0.00	1	6124.
		(0.00)		(173.42)(
			2	5774.
				(163.51)(
ROUTED TO	A12	0.00	1	5895.
		(0.00)		(166.93)(
			2	5517.
				(156.23)(
ROUTED TO	A13	0.00	1	5793.
		(0.00)		(164.03)(
			2	5393.
				(152.70)(

```
51          $B   50.      0.   1140.      1.0  1156.4  1156.4
52          1B   50.      0.   1140.      1.0  1156.4   1170.
53          K     1     A11                                  1
54          K1 ROUTE HYDROGRAPH DOWN MINNEWAWA BROOK FOR 1/2 MILE
55          Y                                 1       1
56          Y1    1
57          Y6   .1     .04      .1   1134.   1155.   2500.   .0024
58          Y7  550.   1155.    700.   1140.    880.   1138.   1000.   1134.   1020.   1138.
59          Y7 1050.   1140.   1200.   1150.   1280.   1155.
60          K     1     A12                                  1
61          K1 ROUTE HYDROGRAPH DOWN MINNEWAWA BROOK FOR ANOTHER 1/2 MILE
62          Y                                 1       1
63          Y1    1
64          Y6   .08     .03     .03   1130.   1145.   2500.   .0016
65          Y7  950.   1145.   1000.   1140.   1980.   1138.   2000.   1130.   2020.   1134.
66          Y7 2020.   1134.   2080.   1140.   2100.   1145.
67          K     1     A13                                  1
68          K1 ROUTE HYDROGRAPH ANOTHER 7000 FT DOWN MINNEWAWA BROOK
69          Y                                 1       1
70          Y1    1
71          Y6   .1     .05      .1   1075.   1120.   7000.    .008
72          Y7  850.   1120.    900.   1125.   1075.   1110.
73          Y7 1020.   1080.   1150.   1100.   1100.   1140.
74          K    99
```

D-21

7

Breach of Childs Bog Dam

Plan 2 - no breach of Seaver & Chesham

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION  JULY 1978
 LAST MODIFICATION  26 FEB 79
**********
     1          A1 CHILDS BOG - SEAVER RESERVOIR - CHESAM POND  DOWNSTREAM HAZARD EVALUATION
                A2 NEW HAMPSHIRE DAM NUMBERS  00056.
                A3
                B    100      0      5      0      0      0      0      0      0      0
                B1     5
                J      2      1      1
                J1     1
                K      0     AA
                K     -1                                                          1
    10          N   248.    363.    566.    786.   1029.   1293.   1571.   1862.   2165.   2483.
    11          M  2820.   3163.   3507.   3846.   4182.   4515.   4839.   5157.   5470.   5772.
    12          N  6063.   6340.   6609.   6867.   7113.   7349.   7576.   7582.   7205.   6722.
    13          N  6313.   5933.   5506.   5042.   4621.   4245.   3911.   3483.   2970.   2534.
    14          N  2181.   1891.   1650.   1449.   1239.   1012.    824.    683.    569.    482.
    15          N   412.    357.    311.    271.    238.    210.    186.    168.    150.    135.
    16          N   121.    110.    100.     91.     83.     76.     69.     64.     59.     54.
    17          N    52.     48.     45.     42.     39.     36.     34.     32.     30.     28.
    18          N    26.     25.     23.     22.     21.     20.     19.     18.     17.     16.
    19          N    15.     14.     14.     13.     12.     12.     11.     11.     10.     10.
    20          K     1     AA                                    1
    21          K1 ROUTE HYDROGRAPH THROUGH SEAVER RESERVOIR
    22          Y                            1      1
    23          Y1     1                                        1204.3      1
    24          Y4  1201.   1202.   1202.3   1203.   1203.7   1204.   1204.3   1205.   1206.   1207.
    25          Y4  1208.   1209.
    26          Y5     0.     46.     69.    226.    547.    683.    824.   1627.   3568.   6637.
    27          Y5 10260.  15444.
    28          $S     0.     20.     40.    100.    140.    260.    360.    466.   1663.
    29          $F  1176.   1181.   1185.   1191.   1192.   1198.   1199.   1201.   1220.
    30          $$  1201.
    31          $D1204.3
    32          K      1     A7                                    1
    33          K1 ROUTE BREACH HYDROGRAPH TO CHESAM POND
    34          Y                            1      1
    35          Y1     1
    36          Y6    .1     .04     .1   1158.   1168.   5286.     .04
    37          Y7   960.   1170.    996.   1160.    998.   1158.   1002.   1158.   1004.   1164.
    38          Y7  1160.   1164.   1140.   1170.   1140.1  1170.
    39          K      1     A10                                   1
    40          K1 ROUTE COMBINED HYDROGRAPH THROUGH CHESAM POND
    41          Y                                  1      1
    42          Y1     1                                        -1156.4      -1
    43          Y4  1154.   1154.2  1154.5   1155.   1155.7   1156.4   1156.7   1157.   1157.2   1157.5
    44          Y4  1158.   1158.5   1159.   1159.5   1160.   1161.   1163.2
    45          Y5     0.     13.     51.    144.    310.    534.    627.    729.    816.    873.
    46          Y5  1173.   1722.   2286.   2875.   3587.   5673.   9849.
    47          $S     0.    180.    300.    460.    630.    700.    985.   1320.   1430.
    48          $F  1140.   1140.   1151.   1156.4  1157.2  1160.   1162.5  1163.2
    49          $$  1154.
    50          $D1156.4
```

D-20

Anderson-Nichols & Company, Inc.

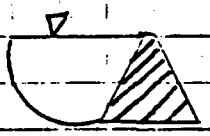
Subject

Sheet No. of
Date
Computed
Checked

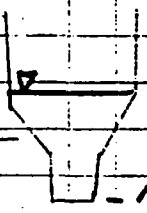
JOB NO.

CASE 4 CHILOS BOG FAILS

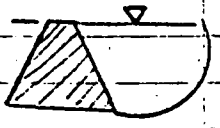
STA A2
CHILOS BOG DAM
$Q_b = 7709$



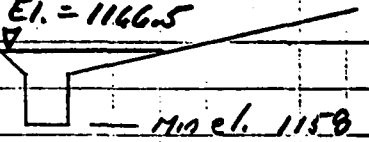
STA A4
INLET TO SEAVER RESERVOIR
$Q_p = 7582$
El. = 1207.4



STA A6
SEAVER RESERVOIR DAM
INITIAL WSEL @ TOP OF DAM 1204.3
$Q_p = 7178$
El. = 1207.2



STA A8
INLET TO CHESAM POND
$Q_p = 7175$
El. = 1166.5



STA A10
CHESAM POND DAM
INITIAL WSEL @ TOP OF DAM 1156.4
$Q_p = 5834$
El. = 1161.1

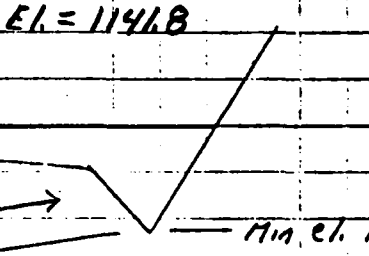
6 houses at or below 1162.0

STA A11
$Q_p = 5774$
El. = 1141.8

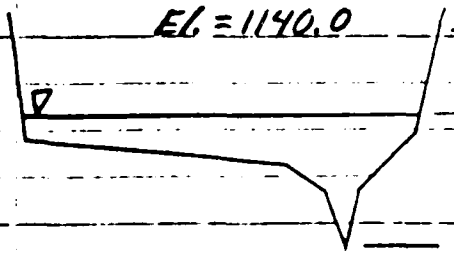
1/2 M1

1 House ≈ 1144
1 House ≈ 1142
1 Trailer ≈ 1139
(located 200 feet d/s of dam)

1/2 M1



STA A12
$Q_p = 5517$
El. = 1140.0



Anderson-Nichols & Company, Inc.

Subject Dam Hazards

Sheet No. 1 of 1
Date 4/14/83
Computed L. Williams
Checked

JOB NO. 3220-06

JARES IN. SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

CHILDS BOG DAM
DOWNSTREAM HAZARD SUMMARY

A major breach could:

1.) Cause Seaver Reservoir Dam to be overtopped by 2.9 feet.

2.) Cause Chesham Pond Dam to be overtopped by 4.7 feet. This rise in the level of Chesham Pond could cause property damage to 4-6 houses located on its shoreline.

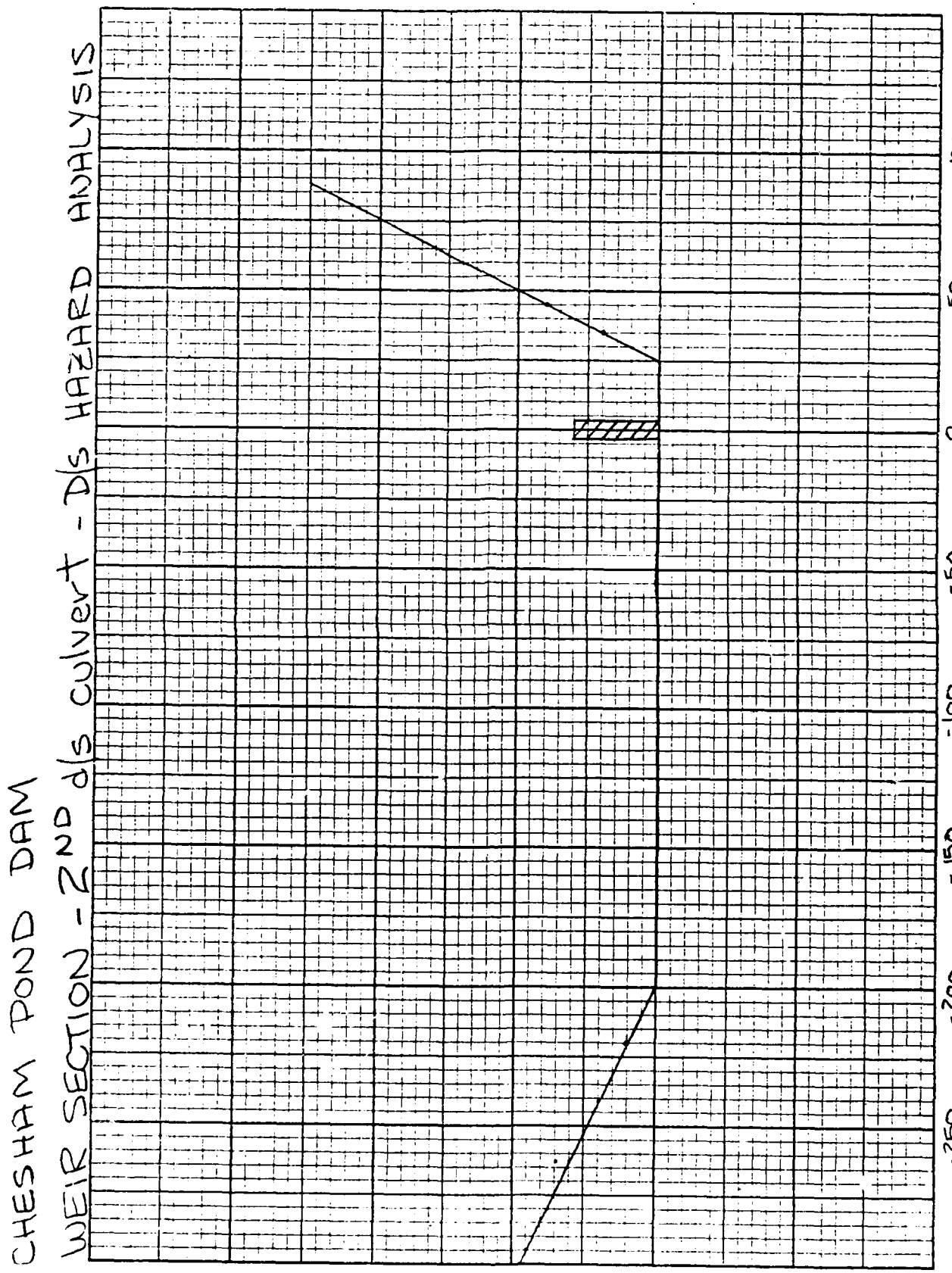
3.) One trailer located 200 feet d/s of Chesham Pond Dam, could be inundated by 2.8 feet of water. This could cause damage to the structure and cause 1 or 2 loss of life.

4.) 1st road crossing (½ mile d/s) would be overtopped by 4.6 feet, possibly causing damage to culvert and roadway. Two houses located just u/s of road may incur minor property damage and basement flooding.

5.) 2ND road crossing (1 mile d/s) would be overtopped by 3 feet, possibly causing damage to gravel roadway and culvert. The breach wave itself would be attenuated in this reach between 1st & 2ND road crossings. One house in this reach may sustain basement flooding.

Childs Bog Dam was classified Significant Hazard.

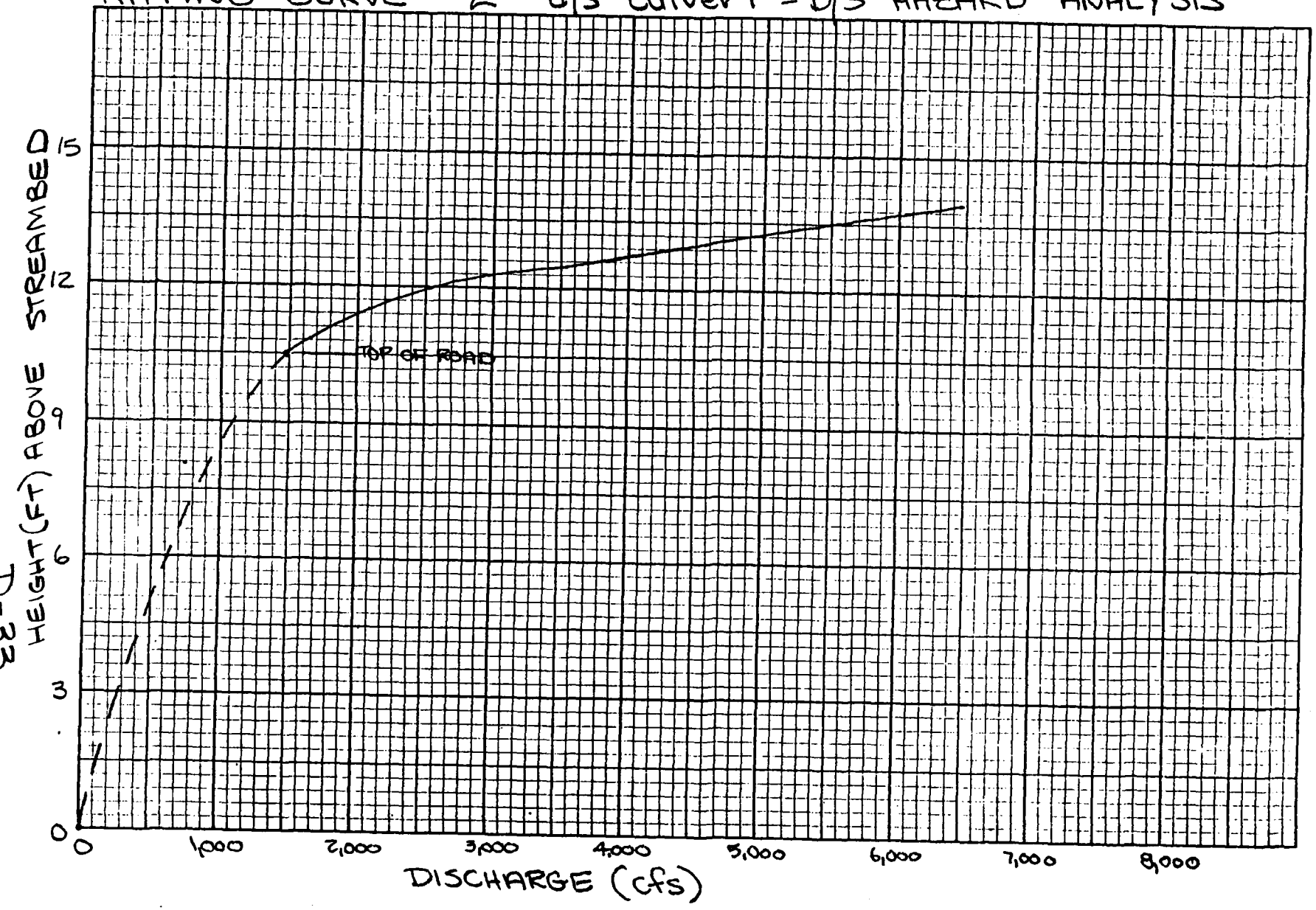
Sheet 7/8
L. Williams
4/10/80



NO. 31,282. 10 DIVISIONS PER INCH, BOTH WAYS. 60 BY ... DIVISIONS
GRAPH PAPER ®
PRINTED IN U.S.A.

CHESHAM POND DAM

RATING CURVE - 2ND d/s culvert - D/S HAZARD ANALYSIS



D-33

Sheet 8/8
L. Williams
4/10/80

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

END

FILMED

8-85

DTIC